HIGHLIGHTS

REVISION NO. 33 Jun 01/10

Pages which have been revised are outlined below, together with the Highlights of the Revision

CH/SE/SU C PAGES	REASON FOR CHANGE	EFFECTIVITY
CHAPTER 72		
L.E.P. 1- 5	Revised to Reflect this revision indicating new,revised, and/or deleted pages	
T. OF C. 1- 5	Revised to reflect this revision	
72-00-00 504, 506- 507, 509- 511, 519- 520	Minor additions and amplification REVISED SAFETY PRECAUTIONS ABOVE IDLE. Layout improved	
72-00-00 602- 605, 608- 650	Minor additions and amplification REVISED EQUIPMENT AND MATERIALS.	
72-00-00 701- 707, 711- 712, 714	Minor additions and amplification ADDED NOTE STATING THAT AN ALTERNATE WATER WASH PROCESS CAN BE PERFORMED. Layout improved	
72-21-00 810- 816, 824- 825	Minor additions and amplification ADDED NOTE CONCERNING THE FAN SPINNER REPLACEMENT.	
72-23-00 601- 616	Minor additions and amplification REVISED INSPECTION PROCEDURE CONCERNING INNER AND OUTER FAN REVERSER SUPPORT RING.	
72-31-00 813- 841	Minor additions and amplification REVISED BLEND LIMITS FOR EACH HPC STAGE.	
72-34-00 601	Minor additions and amplification REVISED DESIGNATION IN EQUIPMENT AND MATERIAL TABLE.	
72-41-00 1- 3	Mod.3626M4608 incorporated No definition	

CH/SE/SU C PAGES	REASON FOR CHANGE	EFFECTIVITY
72-41-00 601- 619	Minor additions and amplification REVISED REFERENCES TO THE COMBUSTOR (BSI) PORTS.	
72-51-00 601	Layout Improved or Effectivity Updated	
72-53-00 601- 625	Minor additions and amplification FURTHER TO TR GE 72-021	
72-57-00 602- 603	Minor additions and amplification ADDED REFERENCE TO THE OVER LIMIT EXTENSIONS INTO THE LPT BLADE INSPECTION.	
72-65-00 601- 613	Minor additions and amplification REVISED INSPECTION/CHECK PROCEDURE OF ACCESSORY GEARBOX ASSEMBLY.	
72-65-00 802, 805- 806, 809, 817- 818, 821, 824- 834	Minor, non technical corrections ADDED REFERENCED PROCEDURE. Minor additions and amplification ADDED REFERENCED PROCEDURE. Layout improved	

CHAPTER 72

ENGINE

LIST OF EFFECTIVE PAGES

N, R or D indicates pages which are New, Revised or Deleted respectively
Remove and insert the affected pages and complete the Record of Revisions and the Record of Temporary Revisions as necessary

CH/SE/SU	C	PAGE	DATE
RECORD			
OF TEMP.			
REVISION			
L.E.P.	R	1- 5	Jun01/10
T. of C.	R	1	Jun01/10
T. of C.	R	2	Jun01/10
T. of C.	R	3	Jun01/10
T. of C.	R	4	Jun01/10
T. of C.	R	5	Jun01/10
72-00-00		1	Jun01/04
72-00-00		2	Jun01/04
72-00-00		3	Jun01/04
72-00-00		4	Jun01/04
72-00-00		5	Jun01/04
72-00-00		6	Jun01/04
72-00-00		7	Jun01/04
72-00-00		8	Jun01/04
72-00-00		9	Jun01/04
72-00-00		201	Jun01/07
72-00-00		202	Jun01/04
72-00-00		203	Jun01/07
72-00-00		204	Jun01/07
72-00-00		205	Jun01/04
72-00-00		206	Jun01/07
72-00-00		207	Jun01/04
72-00-00		208	Jun01/07
72-00-00		209	Jun01/07
72-00-00		210	Jun01/07
72-00-00		211	Jun01/07
72-00-00		212	Jun01/04
72-00-00		213	Jun01/04
72-00-00		214	Jun01/04
72-00-00		215	Jun01/04
72-00-00		216	Jun01/04
72-00-00		217	Jun01/04
72-00-00		218	Jun01/04
72-00-00		219	Jun01/04
72-00-00		220	Jun01/04
72-00-00		221	Jun01/04
72-00-00		222	Jun01/04
72-00-00		501	Jun01/04
72-00-00		502	Jun01/04
72-00-00		503	Jun01/04
72-00-00	R	504	Jun01/10
72-00-00		505	Jun01/04
72-00-00	R	506	Jun01/10
72-00-00	R	507	Jun01/10
72-00-00		508	Jun01/04
72-00-00	R	509	Jun01/10
72-00-00	R	510	Jun01/10
72-00-00	R	511	Jun01/10
72-00-00		512	Jun01/04
72-00-00		513	Jun01/04
72-00-00		514	Jun01/04
72-00-00		515	Jun01/04
72-00-00		516	Jun01/04
72-00-00		517	Jun01/04
72-00-00		518	Jun01/04
72-00-00	R	519	Jun01/10
72-00-00	R	520	Jun01/10
72-00-00		521	Jun01/04
72-00-00		522	Jun01/04
72-00-00		601	Jun01/09
72-00-00	R	602	Jun01/10
72-00-00	R	603	Jun01/10
72-00-00	R	604	Jun01/10
72-00-00	R	605	Jun01/10
72-00-00		606	Jun01/04
72-00-00		607	Jun01/04
72-00-00	R	608	Jun01/10
72-00-00	R	609	Jun01/10
72-00-00	R	610	Jun01/10
72-00-00	R	611	Jun01/10
72-00-00	R	612	Jun01/10
72-00-00	R	613	Jun01/10
72-00-00	R	614	Jun01/10
72-00-00	R	615	Jun01/10
72-00-00	R	616	Jun01/10
72-00-00	R	617	Jun01/10
72-00-00	R	618	Jun01/10
72-00-00	R	619	Jun01/10
72-00-00	R	620	Jun01/10
72-00-00	R	621	Jun01/10
72-00-00	R	622	Jun01/10
72-00-00	R	623	Jun01/10
72-00-00	R	624	Jun01/10
72-00-00	R	625	Jun01/10
72-00-00	R	626	Jun01/10
72-00-00	R	627	Jun01/10
72-00-00	R	628	Jun01/10
72-00-00	R	629	Jun01/10
72-00-00	R	630	Jun01/10
72-00-00	R	631	Jun01/10
72-00-00	R	632	Jun01/10
72-00-00	R	633	Jun01/10
72-00-00	R	634	Jun01/10
72-00-00	R	635	Jun01/10
72-00-00	R	636	Jun01/10
72-00-00	R	637	Jun01/10
72-00-00	R	638	Jun01/10
72-00-00	R	639	Jun01/10
72-00-00	R	640	Jun01/10
72-00-00	R	641	Jun01/10
72-00-00	R	642	Jun01/10
72-00-00	R	643	Jun01/10
72-00-00	R	644	Jun01/10
72-00-00	R	645	Jun01/10
72-00-00	R	646	Jun01/10
72-00-00	R	647	Jun01/10
72-00-00	R	648	Jun01/10
72-00-00	R	649	Jun01/10
72-00-00	R	650	Jun01/10
72-00-00	D	651	
72-00-00	R	701	Jun01/10
72-00-00	R	702	Jun01/10
72-00-00	R	703	Jun01/10
72-00-00	R	704	Jun01/10
72-00-00	R	705	Jun01/10
72-00-00	R	706	Jun01/10
72-00-00	R	707	Jun01/10
72-00-00		708	Jun01/09
72-00-00		709	Jun01/09
72-00-00		710	Jun01/09
72-00-00	R	711	Jun01/10

Printed in France

CH/SE/SU	C	PAGE	DATE
72-00-00	R	712	Jun01/10
72-00-00		713	Jun01/09
72-00-00	R	714	Jun01/10
72-09-03		601	Jun01/04
72-09-03		602	Jun01/04
72-09-03		603	Jun01/04
72-09-03		604	Jun01/04
72-09-03		605	Jun01/04
72-09-03		606	Jun01/04
72-09-04		601	Jun01/04
72-20-00		1	Jun01/04
72-20-00		2	Jun01/04
72-21-00		1	Jun01/04
72-21-00		2	Jun01/04
72-21-00		3	Jun01/04
72-21-00		401	Jun01/04
72-21-00		402	Jun01/06
72-21-00		403	Jun01/06
72-21-00		404	Jun01/06
72-21-00		405	Jun01/06
72-21-00		406	Jun01/06
72-21-00		407	Jun01/06
72-21-00		408	Jun01/06
72-21-00		409	Jun01/06
72-21-00		410	Jun01/06
72-21-00		411	Jun01/06
72-21-00		412	Jun01/06
72-21-00		413	Jun01/06
72-21-00		414	Jun01/06
72-21-00		415	Jun01/06
72-21-00		416	Jun01/06
72-21-00		417	Jun01/06
72-21-00		418	Jun01/06
72-21-00		419	Jun01/06
72-21-00		420	Jun01/06
72-21-00		421	Jun01/06
72-21-00		422	Jun01/06
72-21-00		423	Jun01/06
72-21-00		424	Jun01/06
72-21-00		601	Jun01/04
72-21-00		602	Jun01/07
72-21-00		603	Jun01/07
72-21-00		604	Jun01/07
72-21-00		605	Jun01/07
72-21-00		606	Jun01/07
72-21-00		607	Jun01/07
72-21-00		608	Jun01/07
72-21-00		609	Jun01/07
72-21-00		801	Jun01/04
72-21-00		802	Jun01/04
72-21-00		803	Jun01/04
72-21-00		804	Jun01/04
72-21-00		805	Jun01/04
72-21-00		806	Jun01/04
72-21-00		807	Jun01/04
72-21-00		808	Jun01/04
72-21-00		809	Jun01/04
72-21-00	R	810	Jun01/10
72-21-00	R	811	Jun01/10
72-21-00	R	812	Jun01/10
72-21-00	R	813	Jun01/10
72-21-00	R	814	Jun01/10
72-21-00	R	815	Jun01/10
72-21-00	R	816	Jun01/10
72-21-00		817	Jun01/04
72-21-00		818	Jun01/04
72-21-00		819	Jun01/04
72-21-00		820	Jun01/04
72-21-00		821	Jun01/06
72-21-00		822	Jun01/04
72-21-00		823	Jun01/04
72-21-00	R	824	Jun01/10
72-21-00	R	825	Jun01/10
72-21-00		826	Jun01/04
72-21-01		401	Jun01/04
72-21-01		402	Jun01/04
72-21-01		403	Jun01/04
72-22-00		1	Jun01/04
72-22-00		2	Jun01/04
72-22-00		601	Jun01/04
72-22-00		602	Jun01/04
72-22-00		603	Jun01/04
72-22-00		604	Jun01/09
72-22-00		605	Jun01/04
72-22-00		606	Jun01/09
72-22-00		607	Jun01/04
72-22-00		801	Jun01/04
72-22-00		802	Jun01/04
72-22-00		803	Jun01/04
72-22-00		804	Jun01/04
72-22-00		805	Jun01/04
72-22-00		806	Jun01/04
72-22-00		807	Jun01/04
72-22-00		808	Jun01/04
72-22-00		809	Jun01/04
72-22-00		810	Jun01/04
72-22-00		811	Jun01/04
72-22-00		812	Jun01/04
72-22-00		813	Jun01/04
72-22-00		814	Jun01/04
72-23-00		1	Jun01/04
72-23-00		2	Jun01/04
72-23-00		3	Jun01/04
72-23-00	R	601	Jun01/10
72-23-00	R	602	Jun01/10
72-23-00	R	603	Jun01/10
72-23-00	R	604	Jun01/10
72-23-00	R	605	Jun01/10
72-23-00	R	606	Jun01/10
72-23-00	R	607	Jun01/10
72-23-00	R	608	Jun01/10
72-23-00	R	609	Jun01/10
72-23-00	R	610	Jun01/10
72-23-00	R	611	Jun01/10
72-23-00	R	612	Jun01/10
72-23-00	R	613	Jun01/10
72-23-00	R	614	Jun01/10
72-23-00	R	615	Jun01/10
72-23-00	N	616	Jun01/10
72-23-00		801	Jun01/04
72-23-00		802	Jun01/04
72-23-00		803	Jun01/04
72-23-00		804	Jun01/04
72-23-00		805	Jun01/04
72-23-00		806	Jun01/04
72-23-00		807	Jun01/04
72-23-00		808	Jun01/04
72-23-00		809	Jun01/04
72-23-00		810	Jun01/04
72-23-00		811	Jun01/04
72-23-00		812	Jun01/04
72-23-00		813	Jun01/04
72-23-00		814	Jun01/04
72-23-00		815	Jun01/04
72-23-00		816	Jun01/04
72-23-00		817	Jun01/04
72-23-00		818	Jun01/04
72-24-00		1	Jun01/04
72-24-00		801	Jun01/04
72-24-00		802	Jun01/04
72-24-00		803	Jun01/04
72-24-00		804	Jun01/04
72-24-00		805	Jun01/04
72-24-00		806	Jun01/04
72-24-00		807	Jun01/04
72-24-00		808	Jun01/04
72-24-00		809	Jun01/04

CH/SE/SU	C	PAGE	DATE
72-24-00		810	Jun01/04
72-24-00		811	Jun01/04
72-25-00		1	Jun01/04
72-25-00		2	Jun01/04
72-25-00		601	Jun01/04
72-30-00		1	Jun01/04
72-30-00		2	Jun01/04
72-31-00		601	Jun01/07
72-31-00		602	Jun01/07
72-31-00		603	Jun01/07
72-31-00		604	Jun01/07
72-31-00		605	Jun01/07
72-31-00		606	Jun01/07
72-31-00		607	Jun01/07
72-31-00		608	Jun01/07
72-31-00		609	Jun01/07
72-31-00		610	Jun01/07
72-31-00		611	Jun01/07
72-31-00		612	Jun01/07
72-31-00		613	Jun01/07
72-31-00		614	Jun01/07
72-31-00		615	Jun01/07
72-31-00		801	Jun01/04
72-31-00		802	Jun01/04
72-31-00		803	Jun01/04
72-31-00		804	Jun01/04
72-31-00		805	Jun01/04
72-31-00		806	Jun01/04
72-31-00		807	Jun01/04
72-31-00		808	Jun01/04
72-31-00		809	Jun01/04
72-31-00		810	Jun01/04
72-31-00		811	Jun01/04
72-31-00		812	Jun01/04
72-31-00	R	813	Jun01/10
72-31-00	R	814	Jun01/10
72-31-00	R	815	Jun01/10
72-31-00	R	816	Jun01/10
72-31-00	R	817	Jun01/10
72-31-00	R	818	Jun01/10
72-31-00	R	819	Jun01/10
72-31-00	R	820	Jun01/10
72-31-00	R	821	Jun01/10
72-31-00	R	822	Jun01/10
72-31-00	R	823	Jun01/10
72-31-00	N	824	Jun01/10
72-31-00	N	825	Jun01/10
72-31-00	N	826	Jun01/10
72-31-00	N	827	Jun01/10
72-31-00	N	828	Jun01/10
72-31-00	N	829	Jun01/10
72-31-00	N	830	Jun01/10
72-31-00	N	831	Jun01/10
72-31-00	N	832	Jun01/10
72-31-00	N	833	Jun01/10
72-31-00	N	834	Jun01/10
72-31-00	N	835	Jun01/10
72-31-00	N	836	Jun01/10
72-31-00	N	837	Jun01/10
72-31-00	N	838	Jun01/10
72-31-00	N	839	Jun01/10
72-31-00	N	840	Jun01/10
72-31-00	N	841	Jun01/10
72-32-00		601	Jun01/04
72-32-00		602	Jun01/04
72-32-00		603	Jun01/04
72-32-00		604	Jun01/04
72-32-00		605	Jun01/04
72-32-00		606	Jun01/04
72-32-00		607	Jun01/04
72-32-00		608	Jun01/04
72-32-00		609	Jun01/04
72-32-00		610	Jun01/04
72-32-00		611	Jun01/04
72-32-00		612	Jun01/04
72-32-00		613	Jun01/04
72-32-00		614	Jun01/04
72-32-00		615	Jun01/04
72-32-00		616	Jun01/04
72-32-00		617	Jun01/04
72-32-00		618	Jun01/04
72-32-00		801	Jun01/04
72-32-00		802	Jun01/04
72-32-00		803	Jun01/04
72-32-00		804	Jun01/04
72-32-00		805	Jun01/04
72-32-00		806	Jun01/04
72-32-00		807	Jun01/04
72-32-00		808	Jun01/04
72-32-00		809	Jun01/04
72-32-00		810	Jun01/04
72-32-00		811	Jun01/04
72-32-00		812	Jun01/04
72-32-00		813	Jun01/04
72-32-00		814	Jun01/04
72-32-00		815	Jun01/04
72-32-00		816	Jun01/04
72-32-00		817	Jun01/04
72-32-00		818	Jun01/04
72-32-00		819	Jun01/04
72-32-00		820	Jun01/04
72-32-00		821	Jun01/04
72-32-00		822	Jun01/04
72-32-00		823	Jun01/04
72-32-00		824	Jun01/04
72-32-00		825	Jun01/04
72-34-00	R	601	Jun01/10
72-34-00		602	Jun01/04
72-34-00		603	Jun01/04
72-34-00		604	Jun01/04
72-34-00		605	Jun01/04
72-34-00		606	Jun01/04
72-34-00		801	Jun01/04
72-34-00		802	Jun01/04
72-34-00		803	Jun01/04
72-34-00		804	Jun01/04
72-34-00		805	Jun01/04
72-40-00		1	Jun01/04
72-40-00		2	Jun01/04
72-41-00	N	1	Jun01/10
72-41-00	N	2	Jun01/10
72-41-00	N	3	Jun01/10
72-41-00	R	601	Jun01/10
72-41-00	R	602	Jun01/10
72-41-00	R	603	Jun01/10
72-41-00	R	604	Jun01/10
72-41-00	R	605	Jun01/10
72-41-00	R	606	Jun01/10
72-41-00	R	607	Jun01/10
72-41-00	R	608	Jun01/10
72-41-00	R	609	Jun01/10
72-41-00	R	610	Jun01/10
72-41-00	R	611	Jun01/10
72-41-00	R	612	Jun01/10
72-41-00	R	613	Jun01/10
72-41-00	R	614	Jun01/10
72-41-00	R	615	Jun01/10
72-41-00	N	616	Jun01/10
72-41-00	N	617	Jun01/10
72-41-00	N	618	Jun01/10
72-41-00	N	619	Jun01/10
72-50-00		1	Jun01/04
72-50-00		2	Jun01/04
72-51-00	R	601	Jun01/10

CH/SE/SU	C	PAGE	DATE
72-51-00		602	Jun01/05
72-51-00		603	Jun01/05
72-51-00		604	Jun01/05
72-51-00		605	Jun01/05
72-51-00		606	Jun01/05
72-51-00		607	Jun01/04
72-51-00		608	Jun01/04
72-52-00		601	Jun01/07
72-52-00		602	Jun01/07
72-52-00		603	Jun01/07
72-52-00		604	Jun01/07
72-52-00		605	Jun01/07
72-52-00		606	Jun01/07
72-52-00		607	Jun01/07
72-52-00		608	Jun01/05
72-52-00		609	Jun01/05
72-53-00	R	601	Jun01/10
72-53-00	R	602	Jun01/10
72-53-00	R	603	Jun01/10
72-53-00	R	604	Jun01/10
72-53-00	R	605	Jun01/10
72-53-00	R	606	Jun01/10
72-53-00	R	607	Jun01/10
72-53-00	R	608	Jun01/10
72-53-00	R	609	Jun01/10
72-53-00	R	610	Jun01/10
72-53-00	R	611	Jun01/10
72-53-00	R	612	Jun01/10
72-53-00	R	613	Jun01/10
72-53-00	R	614	Jun01/10
72-53-00	R	615	Jun01/10
72-53-00	R	616	Jun01/10
72-53-00	R	617	Jun01/10
72-53-00	R	618	Jun01/10
72-53-00	R	619	Jun01/10
72-53-00	R	620	Jun01/10
72-53-00	R	621	Jun01/10
72-53-00	N	622	Jun01/10
72-53-00	N	623	Jun01/10
72-53-00	N	624	Jun01/10
72-53-00	N	625	Jun01/10
72-56-00		601	Jun01/04
72-56-00		602	Jun01/04
72-56-00		603	Jun01/04
72-56-00		604	Jun01/04
72-56-00		605	Jun01/04
72-56-00		606	Jun01/04
72-56-00		607	Jun01/04
72-56-00		608	Jun01/04
72-56-00		609	Jun01/04
72-56-00		610	Jun01/04
72-56-00		611	Jun01/04
72-56-00		612	Jun01/04
72-57-00		601	Jun01/04
72-57-00	R	602	Jun01/10
72-57-00	R	603	Jun01/10
72-57-00		604	Jun01/04
72-57-00		605	Jun01/04
72-57-00		606	Jun01/04
72-57-00		607	Jun01/04
72-58-00		601	Jun01/04
72-58-00		602	Jun01/09
72-58-00		603	Jun01/09
72-58-00		604	Jun01/09
72-58-00		605	Jun01/09
72-58-00		606	Jun01/09
72-58-00		607	Jun01/09
72-58-02		401	Jun01/04
72-58-02		402	Jun01/04
72-58-02		403	Jun01/04
72-58-02		404	Jun01/04
72-58-04		401	Jun01/04
72-58-04		402	Jun01/04
72-58-04		403	Jun01/04
72-58-04		404	Jun01/04
72-58-04		405	Jun01/04
72-58-04		406	Jun01/04
72-58-05		401	Jun01/04
72-58-05		402	Jun01/04
72-58-05		403	Jun01/04
72-58-05		404	Jun01/04
72-58-05		405	Jun01/04
72-60-00		1	Jun01/04
72-60-00		2	Jun01/04
72-60-00		3	Jun01/04
72-60-01		401	Jun01/04
72-60-01		402	Jun01/04
72-60-01		403	Jun01/04
72-60-01		601	Jun01/04
72-60-01		801	Jun01/04
72-60-01		802	Jun01/04
72-60-01		803	Jun01/04
72-60-01		804	Jun01/04
72-60-01		805	Jun01/04
72-60-01		806	Jun01/04
72-60-01		807	Jun01/04
72-62-00		401	Jun01/04
72-62-00		402	Jun01/04
72-63-00		401	Jun01/04
72-63-00		402	Jun01/04
72-63-00		403	Jun01/04
72-63-00		404	Jun01/04
72-63-00		405	Jun01/04
72-63-00		601	Jun01/04
72-64-00		401	Jun01/04
72-64-00		402	Jun01/04
72-64-00		403	Jun01/04
72-64-00		404	Jun01/04
72-64-00		601	Jun01/04
72-64-00		801	Jun01/04
72-64-00		802	Jun01/04
72-64-00		803	Jun01/04
72-65-00		501	Jun01/04
72-65-00		502	Jun01/04
72-65-00		503	Jun01/04
72-65-00		504	Jun01/04
72-65-00	R	601	Jun01/10
72-65-00	N	602	Jun01/10
72-65-00	N	603	Jun01/10
72-65-00	N	604	Jun01/10
72-65-00	N	605	Jun01/10
72-65-00	N	606	Jun01/10
72-65-00	N	607	Jun01/10
72-65-00	N	608	Jun01/10
72-65-00	N	609	Jun01/10
72-65-00	N	610	Jun01/10
72-65-00	N	611	Jun01/10
72-65-00	N	612	Jun01/10
72-65-00	N	613	Jun01/10
72-65-00		801	Jun01/08
72-65-00	R	802	Jun01/10
72-65-00		803	Jun01/04
72-65-00		804	Jun01/04
72-65-00	R	805	Jun01/10
72-65-00	R	806	Jun01/10
72-65-00		807	Jun01/08
72-65-00		808	Jun01/08
72-65-00	R	809	Jun01/10
72-65-00		810	Jun01/08
72-65-00		811	Jun01/08
72-65-00		812	Jun01/08
72-65-00		813	Jun01/08
72-65-00		814	Jun01/08
72-65-00		815	Jun01/08

CH/SE/SU	C	PAGE	DATE	CH/SE/SU	C	PAGE	DATE	CH/SE/SU	C	PAGE	DATE
72-65-00		816	Jun01/08								
72-65-00	R	817	Jun01/10								
72-65-00	R	818	Jun01/10								
72-65-00		819	Jun01/08								
72-65-00		820	Jun01/08								
72-65-00	R	821	Jun01/10								
72-65-00		822	Jun01/08								
72-65-00		823	Jun01/08								
72-65-00	N	824	Jun01/10								
72-65-00	N	825	Jun01/10								
72-65-00	N	826	Jun01/10								
72-65-00	N	827	Jun01/10								
72-65-00	N	828	Jun01/10								
72-65-00	N	829	Jun01/10								
72-65-00	N	830	Jun01/10								
72-65-00	N	831	Jun01/10								
72-65-00	N	832	Jun01/10								
72-65-00	N	833	Jun01/10								
72-65-00	N	834	Jun01/10								

CHAPTER 72

ENGINE

TABLE OF CONTENTS

SUBJECT	CH/SE/SU	C	PAGE	EFFECTIVITY
GENERAL	72-00-00			
Description and Operation			1	001-100,
General			1	001-100,
Engine Data			1	001-100,
Fan Modules			1	001-100,
Core Engine Module			3	001-100,
Combustion Liner Assembly			3	001-100,
High Pressure Turbine Module			3	001-100,
Low Pressure Turbine Module			3	001-100,
Accessory Drive Module			3	001-100,
Maintenance Practices			201	001-100,
Preservation Procedures			203	001-100,
Preservation Renewal Requirement			208	001-100,
Procedure for Exceed Lond Term Preservation Period			208	001-100,
Engine Dry-Out Procedure			210	001-100,
Depreservation Procedure			211	001-100,
Removal/Installation of Shipping Cover, 2C14808 or 2C14114			219	001-100,
Adjustment/Test			501	001-100,
Safety Precautions			501	001-100,
Function/Check Guide			501	001-100,
Monitoring Check			501	001-100,
Vibration Check			503	001-100,
Fan Trim Balance - General			504	001-100,
Abnormal Operations			520	001-100,
Engine Adjustments			520	001-100,
Temperature Conversion			520	001-100,
Inspection/Check			601	001-100,
Periodic Inspection/Checks			602	001-100,
Foreign Object Damage (FOD) - Inspection			603	001-100,
Engine Fire or Fire Extinguishing Agents - Checks			604	001-100,
Overshoot of Engine Operational Limits - Checks			605	001-100,
Special Inspections			618	001-100,
Inlet Gearbox Assembly (IGB) - Spline Nozzle Flow Check Borescope Inspection			633	001-100,
Inlet Gearbox Assembly (IGB) - Spline Backlash Check Borescope Inspection			634	001-100,
Engine Borescope Port Acess			647	001-100,
Cleaning/Painting			701	001-100,
Engine Wash			702	001-100,

SUBJECT	CH/SE/SU	C	PAGE	EFFECTIVITY
Specific Area Cleaning			707	001-100,
Coke Ingestion Cleaning of Engine Airfoils			711	001-100,
HOSES AND TUBE ASSEMBLIES	72-09-03			
Inspection/Check			601	001-100,
ENGINE HARDWARE	72-09-04			
Inspection/Check			601	001-100,
AIR INLET SECTION	72-20-00			
Description and operation			1	001-100,
General			1	001-100,
FAN ROTOR ASSEMBLY	72-21-00			
Description and Operation			1	001-100,
Removal/Installation			401	001-100,
Procedure (for selective blades)			401	001-100,
Procedure (for a complete set of blades)			408	001-100,
Inspection/Check			601	001-100,
Approved Repairs			801	001-100,
Blending of First Stage Fan Blades			801	001-100,
Replacement of Fan Spinner			802	001-100,
Stage 1 Fan Blade/Fan Case Shroud Seizure Repair			810	001-100,
Stage 1 Fan Rotor Blade Retainer Repair			811	001-100,
Optional Procedure - RTV Sealant Repair on Dovetail Slots			812	001-100,
Replacement of the Stage 1 Fan Rotor Disk			813	001-100,
NO. 1 BEARING MANIFOLD	72-21-01			
Removal/Installation			401	001-100,
FORWARD FAN CASE ASSEMBLY	72-22-00			
Description and Operation			1	001-100,
Inspection/Check			601	001-100,
Forward Fan Case Assembly Inspection Check			601	001-100,
Approved Repairs			801	001-100,
Forward Fan Case Assembly			802	001-100,
FAN FRAME AND CASE ASSEMBLY	72-23-00			
Description and Operation			1	001-100,
Inspection/Check			601	001-100,
Approved Repairs			801	001-100,
FAN ROTOR MIDSHAFT ASSEMBLY	72-24-00			
Description and Operation			1	001-100,
Approved Repairs			801	001-100,
Removal of Oil from the Fan Midshaft			801	001-100,

Printed in France

SUBJECT	CH/SE/SU	C	PAGE	EFFECTIVITY
FAN STATOR ASSEMBLY	72-25-00			
Description and Operation			1	001-100,
Inspection/Check			601	001-100,
COMPRESSOR SECTION	72-30-00			
Description and Operation			1	001-100,
General			1	001-100,
COMPRESSOR ROTOR	72-31-00			
Inspection/Check			601	001-100,
Approved Repairs			801	001-100,
Repair of the Nicks on the HPC Stage 1 Blades, on Wing			801	001-100,
Unshingle the HPC Stage 1 Blades, on Wing			809	001-100,
Blend Repair of HPC Rotor Blades			812	001-100,
COMPRESSOR VARIABLE STATOR ASSEMBLY	72-32-00			
Inspection/Check			601	001-100,
Approved Repairs			801	001-100,
Replacement of VSU Lever Arm-Stages IGV Through 2			801	001-100,
Replacement of VSU Lever Arm-Stages 3 and 4			804	001-100,
Replacement of Stage 5 VSV Lever Arm			805	001-100,
VSV Outer Flanged Bushing Removal/Installation			805	001-100,
Replacement of VSV Actuation Lever			807	001-100,
Replacement of the Slot Loaded Bearing Ball			813	001-100,
Repair of the Slot Loaded Bearing with RTV			815	001-100,
Replacement of VSV Clevis Assembly			816	001-100,
Replacement of Connecting Links			823	001-100,
COMPRESSOR REAR FRAME ASSEMBLY	72-34-00			
Inspection/Check			601	001-100,
Approved Repairs			801	001-100,
COMBUSTION SECTION	72-40-00			
Description and Operation			1	001-100,
General			1	001-100,
COMBUSTION CHAMBER ASSEMBLY	72-41-00			
Description and Operation			1	001-100,
General			1	001-100,
Description			3	001-100,
Inspection/Check			601	001-100,
TURBINE SECTION	72-50-00			
Description and Operation			1	001-100,

Printed in France

SUBJECT	CH/SE/SU	C	PAGE EFFECTIVITY
STAGE 1 HIGH PRESSURE TURBINE NOZZLE ASSEMBLY	72-51-00		
Inspection/Check			601 001-100,
STAGE 2 HIGH PRESSURE TURBINE NOZZLE ASSEMBLY	72-52-00		
Inspection/Check			601 001-100,
HIGH PRESSURE TURBINE ROTOR ASSEMBLY	72-53-00		
Inspection/Check			601 001-100,
LOW PRESSURE TURBINE ASSEMBLY	72-56-00		
Inspection/Check			601 001-100,
Visual Inspection/Check			601 001-100,
LPT Case Forward and Aft Flanges			601 001-100,
LPT Case Body			602 001-100,
Threaded Borescope Ports and Bosses			603 001-100,
Clearance Control Manifold			606 001-100,
7th-Stage Air Manifold			609 001-100,
Borescope Inspection/Check			609 001-100,
LOW PRESSURE TURBINE ROTOR ASSEMBLY	72-57-00		
Inspection/Check			601 001-100,
TURBINE REAR FRAME ASSEMBLY	72-58-00		
Inspection/Check			601 001-100,
D-SUMP COVER AND OIL SLINGER SEAL	72-58-02		
Removal/Installation			401 001-100,
OIL SUPPLY TUBE AND OIL SCAVENGE TUBE	72-58-04		
Removal/Installation			401 001-100,
NOZZLE - OIL SUPPLY	72-58-05		
Removal/Installation			401 001-100,
General			401 001-100,
Removal Procedure			401 001-100,
Installation Procedure			402 001-100,
ACCESSORY DRIVE	72-60-00		
Description and Operation			1 001-100,
N1 CONTROL ADAPTER ASSEMBLY	72-60-01		
Removal/Installation			401 001-100,
Inspection/Check			601 001-100,
Approved Repairs			801 001-100,
Replacement of N1 Control Adapter Magnetic Seal Assembly			801 001-100,
RADIAL DRIVE SHAFT	72-62-00		
TRANSFER GEARBOX	72-63-00		
Inspection/Check			601 001-100,

Printed in France

SUBJECT	CH/SE/SU	C	PAGE EFFECTIVITY
HORIZONTAL DRIVESHAFT ASSEMBLY	72-64-00		
Removal/Installation			401 001-100,
Inspection/Check			601 001-100,
Approved Repairs			801 001-100,
ACCESSORY GEARBOX ASSEMBLY	72-65-00		
Adjustment/Test			501 001-100,
Inspection/Check			601 001-100,
Approved Repairs			801 001-100,
Replacement of Accessory Gearbox Drive Pad Magnetic Seals and Carbon Seals			801 001-100,
Replacement of Accessory Gearbox Adapter - Gearshaft Package			809 001-100,
R Replacement of Accessory Gearbox Control Alternator Adapter - Gearshaft Package			821 001-100,

1. General
(Ref. Fig. 001, 002, 003)
(Ref. Fig. 004, 005, 006)

A. The CF6-80C2A engine is a high bypass ratio, dual rotor, axial flow turbofan powerplant. The 14 stage high pressure compressor is driven by a two-stage high pressure turbine and the integrated front fan and a 4 stage booster is driven by a 5 stage low pressure turbine. An annular combustor converts fuel and compressor discharge air into energy to drive the high and low pressure turbines. The engine features direct fan speed control and clearance control for both low pressure and high pressure turbines.

B. The accessory drive section gets energy from the high pressure compressor rotor to drive the engine accessories and the engine-attached aircraft accessories.

C. Reverse thrust for braking the aircraft after landing is supplied by an integrated system that uses fan discharge airflow.

2. Engine Data

A. The subsequent data is for the CF6-80C engine without optional and additional equipment :

(1)Nominal thrust class ..... 57,000 lbs (253.7 kN)
(2)Nominal engine length ..... 170 in. (4318 mm)
(3)Nominal engine diameter ..... 100 in. (2540 mm)
(4)Nominal engine weight ..... 9000 lbs (4050 kg)
(5)Direction of turn ..... Clockwise

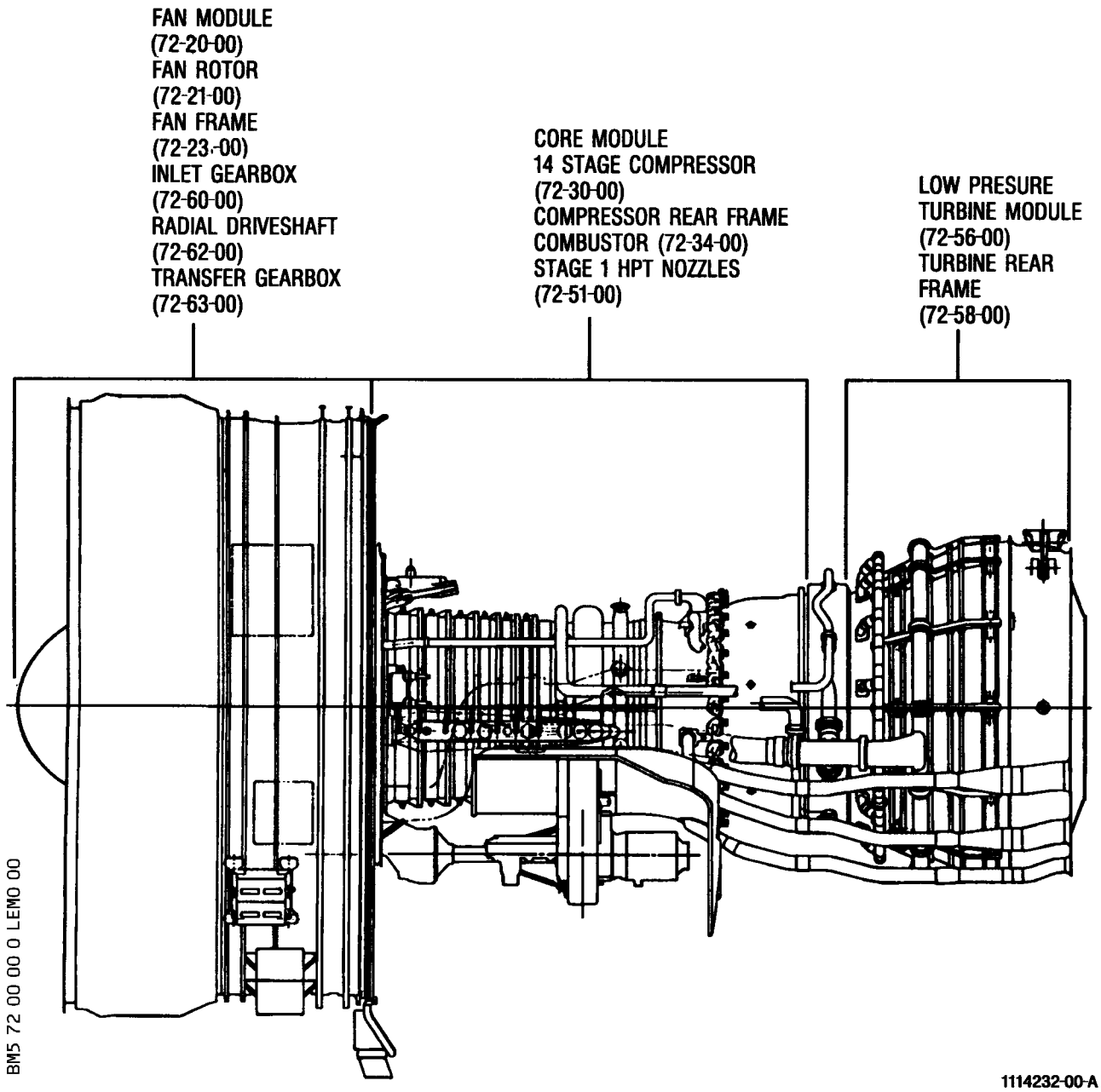
NOTE : Nominal engine length is without turbine nozzle.
NOTE : Nominal engine diameter is overall diameter.
NOTE : Nominal engine weight is dry weight.
NOTE : Direction of turn is for both rotors.

3. Fan Modules (Ref. Fig. 002)

A. The fan module has a single stage, high ratio, front-attached fan and a 4-stage, axial flow compressor booster driven by the low pressure turbine. The fan frame is the largest support structure. It supports the front of the compressor, the fan rotor, fan stator, inlet gearbox, radial drive shaft, transfer gearbox, and the forward engine mount.
It also gives a variable bypass valve system that has 12 variable bleed valves (VBV's) located between the struts.

B. The fan rotor has a 93 in. (2362 mm) diameter first stage and a smaller diameter on stages 2, 3, 4, and 5 that supercharge the inner portion of the fan flow entering the compressor.

C. The fan mid-shaft attaches the fan rotor to the low pressure turbine rotor. The shaft transmits torque from the turbine rotor to the fan rotor.



Engine Modules
Figure 001

D. The fan stator has fixed stator vanes mounted behind all stages of the rotor. Acoustic panels line the fan casing to reduce sound levels.

E. A hydro-mechanical fan speed sensor provides a fan speed signal to the main engine control.

4. Core Engine Module (Ref. Fig. 003)

A. The core engine module consists of a 14 stage compressor rotor and stator, compressor rear frame (CRF), combustion liner and stage 1 high pressure turbine nozzle assemblies.
The front of the compressor stator is supported by the fan frame and the rotor by a bearing in the fan frame. The rear of the compressor stator is supported by the compressor rear frame, and the rear of the compressor rotor is supported by two bearings in the compressor rear frame.
(1) The inlet guide vanes and the first five stator stages of the compressor use variable angle vanes whose angular position is changed as a function of core engine speed (N2) and compressor inlet temperature (CIT). The variability of angle vanes makes the stall margin and compressor efficiency at its best.
(2) Part of the fan discharge airflow is passed through the compressor and is compressed as the air moves from stage to stage. The stage 14 discharge air output is compressed by a ratio of approximately 30 to 1.

5. Combustion Liner Assembly (Ref. Fig. 004)

A. The combustion liner assembly in the compressor rear frame is a rolled-ring annular combustor consisting of a cowl assembly, inner and outer liners, and a dome assembly that has swirler cups for the 30 fuel nozzles. The stage 1 high pressure turbine nozzle assembly mounts behind the combustor on an inner support of the compressor rear frame. The fuel nozzles and two igniters mount in ports of the compressor rear frame and go into the combustor.

6. High Pressure Turbine Module (Ref. Fig. 005)

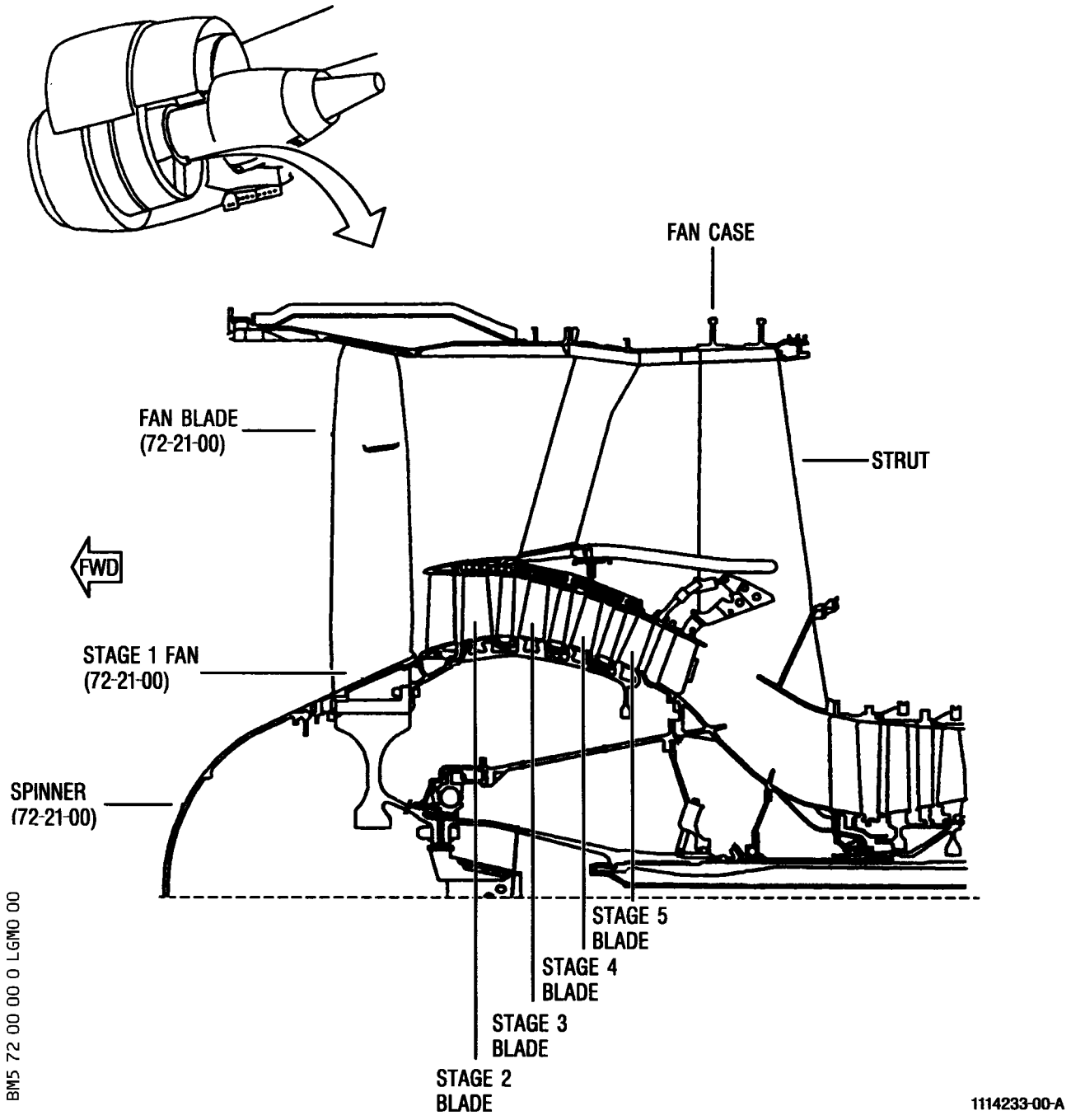
A. The high pressure turbine module has a stage 2 HPT nozzle assembly and rotor. The nozzles are supported by the compressor rear frame. The high pressure turbine rotor is attached to the high compressor rotor.

7. Low Pressure Turbine Module (Ref. Fig. 005)

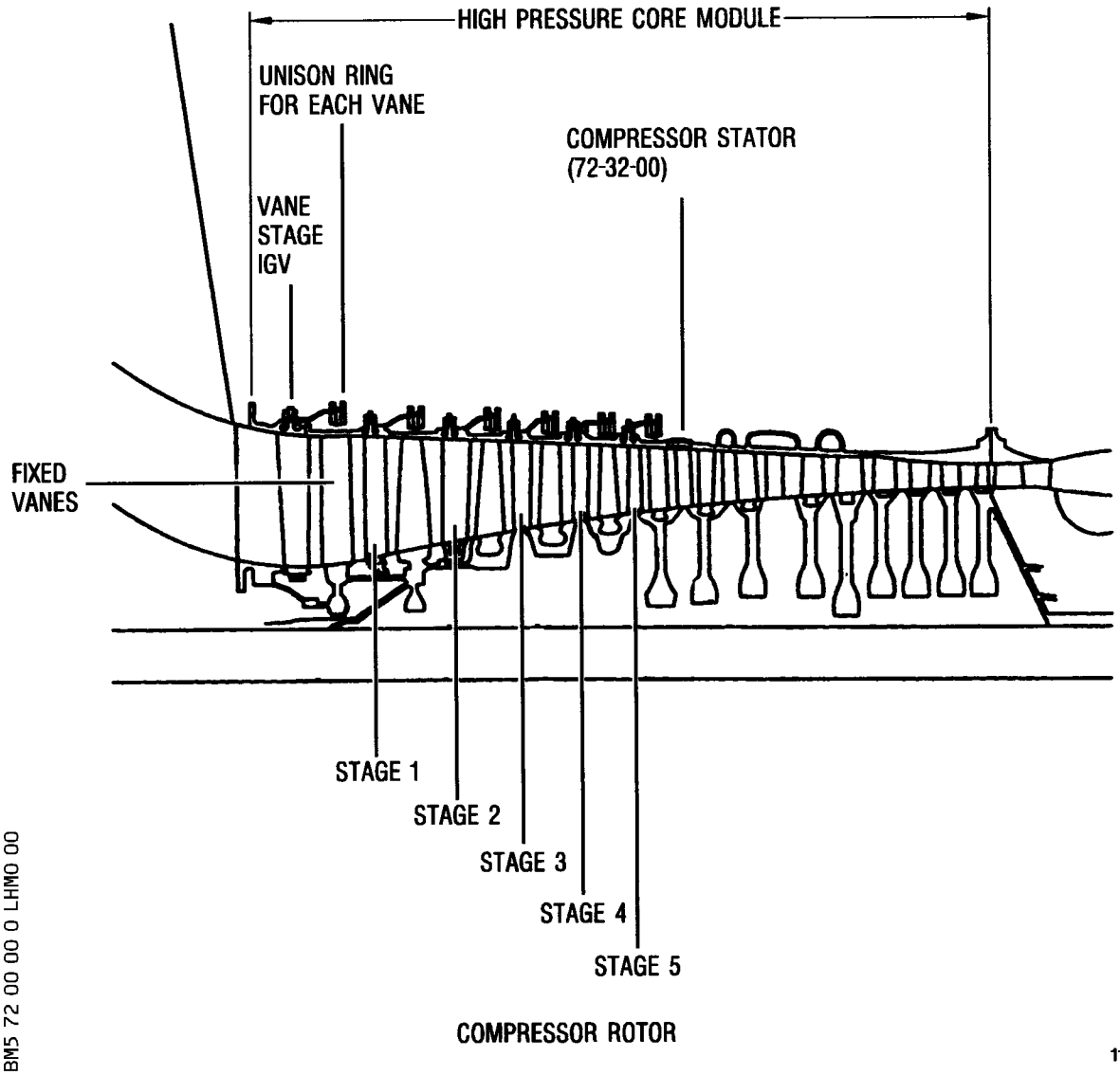
A. The low pressure turbine module has a 5 stage turbine rotor, nozzles, stator case, and rear frame. Around the stator case is a clearance control manifold system. The low pressure turbine rotor is attached to the fan rotor by the fan mid-shaft.

8. Accessory Drive Module (Ref. Fig. 006)

A. The accessory drive module has the inlet gearbox, radial drive shaft, and transfer gearbox supported in the fan frame. The horizontal drive

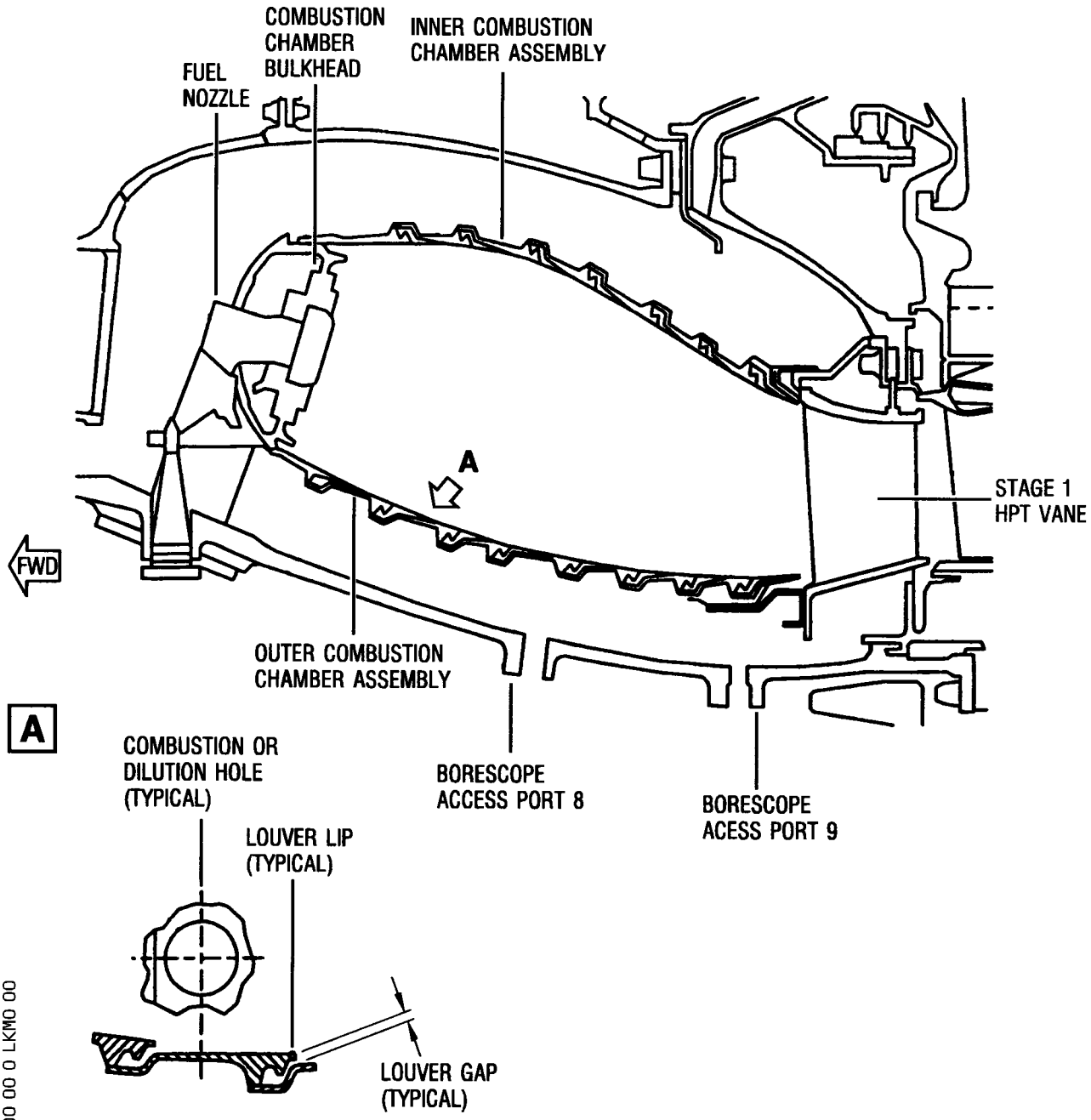


Fan Modules
Figure 002



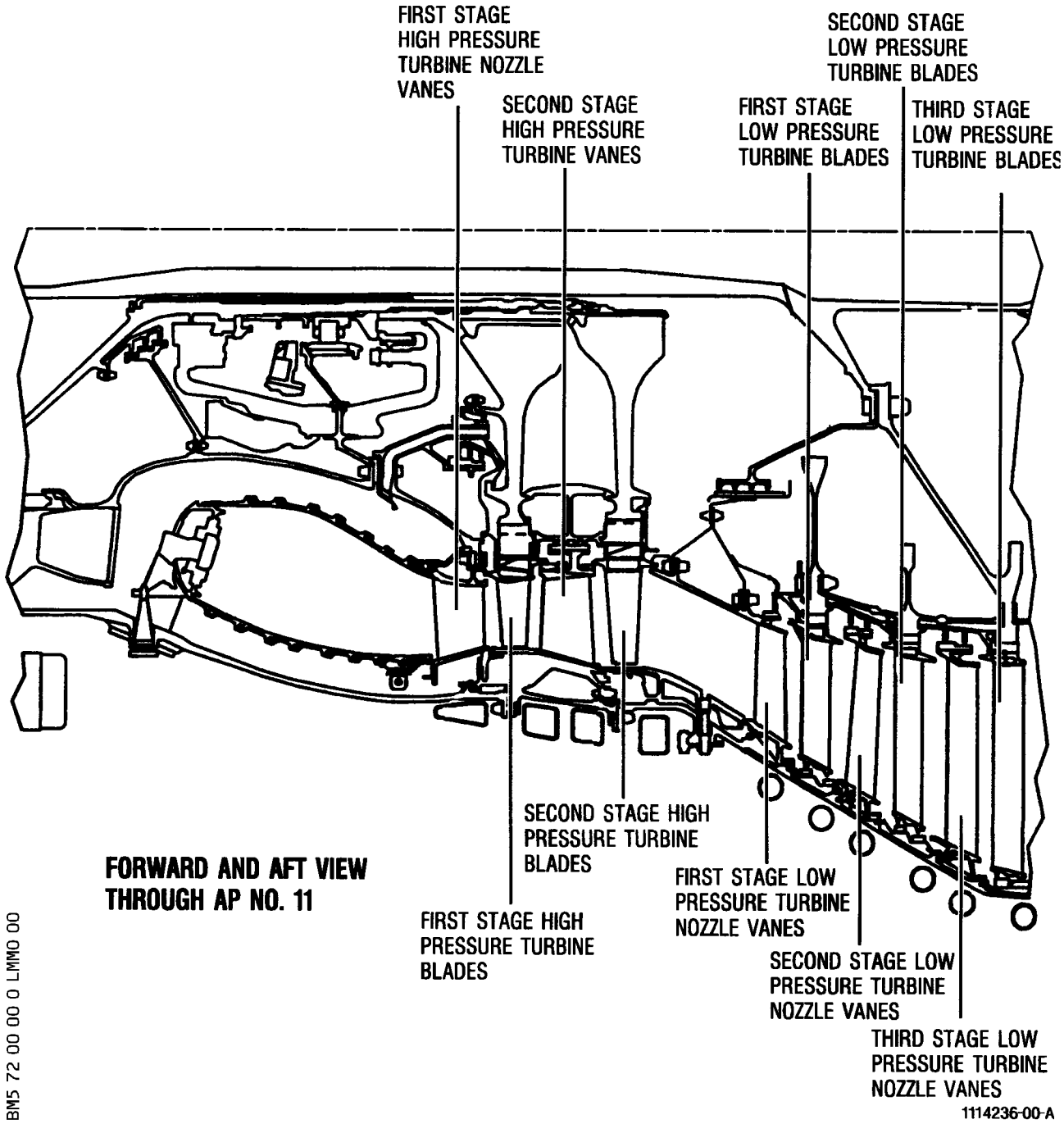
BM5 72 00 00 0 LHM0 00

Core Engine Modules
Figure 003



BM5 72 00 00 0 LKM0 00

Combustion Liner Assembly
Figure 004


FIRST STAGE HIGH PRESSURE TURBINE NOZZLE VANES
SECOND STAGE HIGH PRESSURE TURBINE VANES
SECOND STAGE LOW PRESSURE TURBINE BLADES
FIRST STAGE LOW PRESSURE TURBINE BLADES
THIRD STAGE LOW PRESSURE TURBINE BLADES
FORWARD AND AFT VIEW THROUGH AP NO. 11
SECOND STAGE HIGH PRESSURE TURBINE BLADES
FIRST STAGE LOW PRESSURE TURBINE NOZZLE VANES
FIRST STAGE HIGH PRESSURE TURBINE BLADES
SECOND STAGE LOW PRESSURE TURBINE NOZZLE VANES
THIRD STAGE LOW PRESSURE TURBINE NOZZLE VANES
1114236-00-A
BM5 72 00 00 0 LMM0 00

HPT and LPT Modules
Figure 005

shaft, accessory gearbox, engine accessories, and accessory heatshield are supported by the core engine. The function of this module is to get energy from the high pressurecompressor rotor that drives the engine-mounted accessories, and giving the core engine speed signal to the main engine control (MEC).

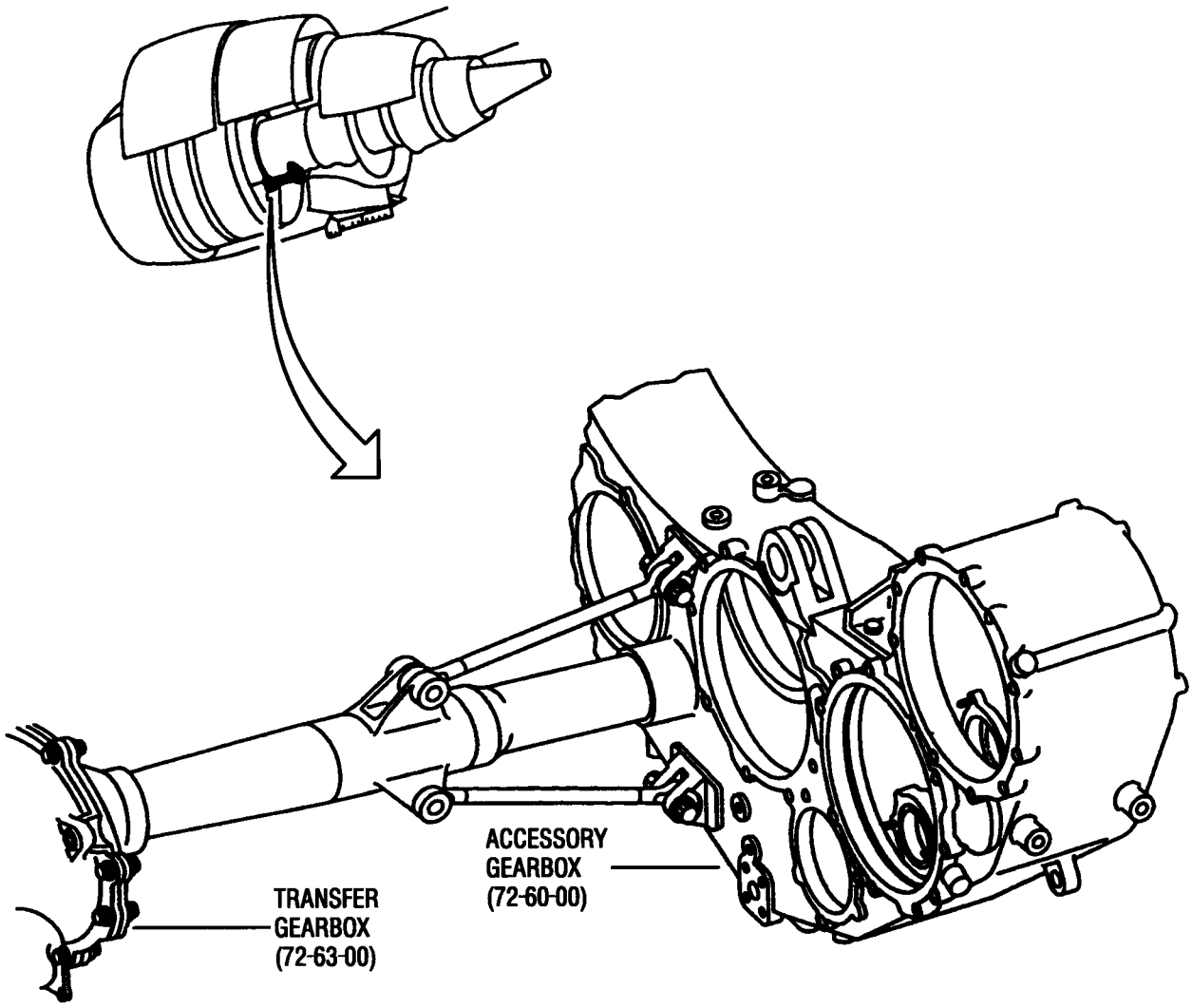
(1) The inlet gearbox is located in the fan frame and attaches to the forward shaft of the high pressure compressor rotor.
The gearbox gets energy from the high pressure compressor rotor and transmits the energy to the radial drive shaft.

(2) The radial drive shaft is located within the No. 7 strut of the fan frame. The shaft transmits power from the inlet gearbox to the transfer gearbox.

(3) The transfer gearbox is on the fan frame in an enclosed 45 bevel gear train. The transfer gearbox changes direction of the energy from radial to axial. It is changed from the radial drive shaft to the horizontal drive shaft that powers the accessory gearbox.

(4) The accessory gearbox is attached to the underside of the engine compressor stator case. Engine and aircraft accessory mounting and drive pads are given on both the forward and rear faces of the gearbox. The engine accessories mounted on the gearbox are : starter, main fuel pump, main engine control, lube and scavenge pump, and control alternator. Pads are also given for the attachment of aircraft hydraulic pumps and the integrated drive generator.

(5) The accessory heat shield is a sheet-metal thermal barrier that protects the accessory gearbox and accessories from the heat of the engine.



BM5 72 00 00 0 LPM0 00

1114237-00-A

Accessory Drive Modules
Figure 006

1. General

A. The procedures which follow are recommended as the minimum necessary to protect the CF6 engine against corrosion, liquid and debris entering the engine, and atmospheric conditions during period of storage, inactivity ; or following an engine-out ferry, aircraft pod transportation, or landing following an In Flight Shut Down (IFSD). These procedures are also recommended for installed engines on inoperative aircraft or an engine
R not to be operated for more than 30 days.

B. The procedure recommended for preservation of the engine will vary depending upon the duration of inactivity, the type of preservation used, and if the engine is operable or non-operable.

NOTE : Engines that can be started are considered operable. Engines that for any reason cannot be started are considered non-operable.

(1)The preservation procedure is based upon the following schedule:

R (a)Up to 30 days.

R (b)Up to three months.

R (c)Three months to one year.

(d)Indefinite.

NOTE : There is no restriction on the number of times the preservation procedure can be renewed, as long as it is accomplished every year.

C. The preservation procedures in this section are recommended as a guide in determining what precautions should be exercised to provide adequate protection to the engine from the elements during periods of storage and inactivity. Engine preservation is a flexible program that should be implemented in such a manner which best fits the particular weather and storage conditions involved. A program for inactive engines exposed to high humidity and/or large temperature changes, especially if near a salt water area, definitely requires more attention to preservation needs than those engines stored in drier climates or less severe weather conditions.

D. The preservation program for spare and/or stored engines must be planned in advance to implement the preservation renewal requirements and monitored regularly to assure that the required action is implemented prior to the expiration of the preservation period. Dependent upon weather conditions and the condition of the engine protection equipment/covers, the effectiveness of the preservation protection should be evaluated and modified to keep the engine in a serviceable condition.

NOTE : Engines cannot be preserved and placed into storage and forgotten. A viable plan (as disciplined as for an engine in revenue service) must be defined and then implemented.

E. When desiccants (C10-001) are used they must be changed on a regular basis, determined by the environmental conditions, to keep the desiccant effective.

F. It is recommended that the Variable Bypass Valve (VBV) doors be pumped closed any time the engine is to be preserved and stored or maintenance is being performed in this area. This will avoid the possibility of foreign objects entering the core engine inlet through the VBV doors. The doors can be pumped closed as follows :

(1) Disconnect VBV head-end and rod-end tubes at the tube bundle running beneath the forward end of the compressor case.

(2) Connect actuator, 2C6395G05, (using hydraulic medium C02-021 or C04-002) to manifolds.

CAUTION : DO NOT EXCEED 300 PSIG (20.68 bars) SUPPLY PRESSURE THROUGH VBV ACTUATORS. IF YOU USE MORE THAN 300 PSIG (20.68 BARS) YOU CAN DAMAGE THE EQUIPMENT.

(3) Actuate VBV doors fully closed (actuator rods retracted) by applying 200 to 300 psig (13.79 - 20.69 bars) at actuator rod-end.

(4) Disconnect actuator, 2C6395G05, from head-end and rod-end tubes.

(5) Reconnect the tubes to the normal engine configuration.

(6) TORQUE VBV head-end tube to 450 and 550 lbf.in. (5.1 and 6.2 m.daN). TORQUE VBV rod-end tube to between 270 and 300 lbf.in. (3.1 and 3.4 m.daN.).

2. Equipment and Materials

NOTE : Equivalent substitutes may be used instead of the following items.

ITEM	DESIGNATION
A. 2C6395	Actuator, VBV Hydraulic
B. 2C8084	Adapter Kit, Engine Dry Out
C. 2C14808	Cover, Engine Shipping
D. 2C14114	Cover, Engine Shipping
E. 2C14130	Fixture, Engine Lift
F. 2C14649	Adapter, Core Motoring- Borescope
G. Material No.C01-025	Adhesives, Plastics, Sealants (Ref. 70-00-00)
H. Material No.C02-019	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
I. Material No.C02-021	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
J. Material No.C02-025	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
K. Material No.C02-051	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
L. Material No.C02-058	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
M. Material No.C10-001	Miscellaneous (Ref. 70-00-00)
N. Material No.C10-009	Miscellaneous (Ref. 70-00-00)
O. Material No.C10-030	Miscellaneous (Ref. 70.00-00)
P. Material No.C10-128	Miscellaneous (Ref. 70-00-00)
Q.	Stand Shipping/Storage
R.	TORQUE Wrench 50-125 lbf. in. (0.57 - 1.41 m.daN.)
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors

ITEM	DESIGNATION
- 73-33-11, P. Block 401	Fuel Pressure - Transmitter
- 75-32-01, P. Block 501	Variable Bypass Valve - Actuator
- 79-00-00, P. Block 301	Oil - General

3. Preservation Procedures

CAUTION : IF ENGINE WAS FERRIED, AIRCRAFT POD TRANSPORTED OR SUBJECTED TO AN IFSD, ENGINE MUST BE "DRIED OUT" WITHIN 48 HOURS PER DRY OUT PROCEDURE OF THIS SECTION. MOISTURE WILL DAMAGE THE ENGINE IF IT IS NOT "DRIED OUT" WITHIN 48 HOURS.

CAUTION : UNDER NO CIRCUMSTANCES SHALL PRESERVATIVE OIL OR EQUIVALENT BE SPRAYED INTO THE ENGINE INLET, CORE COMPRESSOR OR TURBINE, OR ENGINE EXHAUST. DIRT PARTICLES DEPOSITED ON THE WETTED BLADES AND VANES MAY ADVERSELY AFFECT ENGINE PERFORMANCE DURING SUBSEQUENT OPERATION.

R A. Period Up to 30 Days - Operable Engine (On Wing)
R (1)Start engine, stabilize at ground idle for 15 minutes, and shut down.
R (2)Repeat at least every 30 days.
R (3)If engine is going to exceed the 30 day limit, it is recommended
R installing the engine covers per the up to three month preservation procedure.

R B. Period Up to 30 Days - Non-Operable Engine
(1)Motor engine (if possible) as follows :
(a)Motor engine at maximum motoring speed (minimum of 20 percent N2) for four minutes.
(b)Terminate motoring and allow to coast down.
WARNING : DO NOT ATTEMPT MANUAL ROTATION OF FAN ROTOR WITHOUT USE OF HEAVY PROTECTIVE GLOVES. USE CARE TO AVOID PERSONAL INJURY. ASSURE SAFE, FIRM FOOTING.
(c)If fan rotor did not rotate during motoring, manually pull/turn through at least two complete revolutions.
(2)Dry out engine per dry out procedure of this section if engine was ferried, aircraft pod transported or subjected to an IFSD.
(3)If engine is non-operable for reasons other than those mentioned in step
R (2), consider engine preserved for 30 days from time of last operation.

R C. Period Up to Three Months - Operable Engine
R (1)Start engine, stabilize at ground idle for 15 minutes and shut down. Actuate the VBV doors fully closed with the hydraulic actuator, 2C6395, to avoid the possible entrance of foreign objects into the core inlet.
(2)Seal engine inlet and exit openings with moisture barrier material.
(3)Cap or cover all strut, piping and accessory openings.
(4)Cover entire engine with a shipping cover, 2C14808 or 2C14114, and secure tightly in place if in a trailer or on a stand. If on wing, cover entrance to fan cowling and exit opening of tailpipe.

R D. Period Up to Three Months - Non-Operable Engine

R (1)Comply with preservation procedure for non-operable engine up to 30 days.
(2)Seal engine inlet and exit openings with moisture barrier material.
(3)Cap or cover all strut, piping and accessory openings.
(4)Cover entire engine with a shipping cover, 2C14808 or 2C14114, and secure tightly in place if in a trailer or on a stand. If on wing, cover entrance to fan cowling and exit opening of tailpipe.

R E. Period Three Months to One year - Operable Engine
(1)Replace the oil that is in the oil tank with engine oil (C02-019) mixed with preservative (C02-051). Make the mixture with at least 7 percent preservative (by volume). Put at least 5 gallons (19 liters) of this mixture into the oil tank.
(2)Open thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
NOTE : If engine is to be motored without accessories at the accessory gearbox customer accessory pads, make certain that pad covers and gaskets are installed and cap the pad cavity drains to prevent loss of engine oil.
(3)Position container under main fuel supply hose drain plug.
(4)Remove drain plug from fuel pump and allow fuel to drain into container.
(5)Install new packing on drain plug and install in fuel pump.TORQUE plug to between 130 and 150 lbf.in. (1.47 and 1.70 m.daN). Lockwire plug.
(6)Properly dispose of drained fuel.
(7)Disconnect main fuel supply hose at fuel pump inlet.
(a)Remove four bolts and washers securing main fuel supply hose to fuel pump inlet mounting flange and bracket. Remove and retain for reuse if serviceable.
(b)Install protective caps on open end of main fuel supply hose and fuel pump inlet port.
(8)Disconnect hose assembly from reference pressure port (PCR) on main engine control (MEC) and install protective cap on open hose end.
(9)Install temporary drain line from PCR port on MEC to 10 gallons (38 liters) container.
(10)Remove fuel pressure transmitter from fuel pump (Ref. 73-33-11, P. Block 401).
CAUTION : DO NOT USE ANY SILICONE BASE OILS IN THE FUEL SYSTEM. SILICONE BASE OILS WILL DAMAGE THE FUEL SYSTEM.
CAUTION : PRIOR TO PUMPING OF PRESERVATION OIL (C02-025) TO POWER PLANT, TEMPERATURE OF SUPPLY OIL MUST BE BETWEEN 70°F (21°C) AND 120°F (49°C). AN INCORRECT TEMPERATURE OF THE PRESERVATION OIL WILL DAMAGE THE POWER PLANT.
(11)Ensure temperature of preservation oil (C02-025) supply in oil pressurizing cart is between 70°F (21°C) and 120°F (49°C) before connecting oil pressurizing cart to fuel pump.
CAUTION : DO NOT USE ANY SILICONE BASE OILS OR PERMIT FUEL SYSTEM CONTAMINATION DURING CONNECTION OF OIL PRESSURIZING CART. SILICONE BASE OILS OR FUEL SYSTEM CONTAMINATION WILL DAMAGE THE ENGINE.
(a)Connect oil pressurizing cart to boost discharge pressure port of fuel pump.

NOTE : If oil pressurizing cart is not available, a gravity flow container system connected to fuel pump inlet pad man be used providing the container is held 12 in. (305 mm) above the fuel pump.

(b)Pump preservation oil not exceeding a flow pressure of 50 psig (3.45 bars) into fuel pump until fuel free oil flows out of temporary drain line attached to PCR port of the MEC.

(12)Dry motor engine as follows :

(a)Make certain that the MEC fuel shutoff lever is CLOSED.

(b)Check oil supply to fuel pump and pressurize up to 50 psig (3.45 bars) maximum or gravity feed oil at a height of one foot (304.8 mm) above fuel pump.

(c)Motor engine at maximum motoring speed (minimum of 20 percent N2) for four minutes.

(d)Terminate motoring and allow to coast down.

(13)Remove oil supply pressure to fuel pump boost discharge pressure port.

WARNING : DO NOT ATTEMPT MANUAL ROTATION OF FAN ROTOR WITHOUT USE OF HEAVY PROTECTIVE GLOVES. USE CARE TO AVOID PERSONAL INJURY. ASSURE SAFE, FIRM FOOTING.

(14)If fan rotor did not rotate during motoring, manually pull/turn through at least two complete revolutions.

(15)Remove temporary drain line from the reference pressure port (PCR) of the MEC and reinstall hose assembly. TORQUE coupling nut to between 130 and 150 lbf.in. (1.47 and 1.70 m.daN).

(16)Reapply oil supply pressure to fuel pump boost discharge pressure port not to exceed a flow pressure of 50 psig (3.45 bars) maximum.

(17)Dry motor engine to maximum motoring speed, move fuel shutoff lever to Open for 10 seconds, place lever to CLOSED and continue motoring for two minutes.

(18)Terminate motoring and allow to coast down.

(19)Disconnect oil pressurizing cart or gravity flow system from fuel pump.

(20)Install fuel pressure transmitter in fuel pump (Ref. 73-33-11, P. Block 401).

(21)Connect main fuel supply hose to fuel pump inlet.

(a)Remove caps from main fuel supply hose and fuel pump inlet.

(b)Attach main fuel supply hose to fuel pump inlet mounting flange and bracket using four bolts and washers. TORQUE bolts to between 55 and 70 lbf.in.(0.62 and 0.79 m.daN).

(22)Actuate the VBV doors fully closed with the hydraulic actuator, 2C6395, to avoid the possible entrance of foreign objects into the core inlet.

(23)Close thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

(24)Seal the engine inlet and exit openings with moisture barrier material.

(25)Seal all engine openings, particularly struts, piping, and accessory openings with caps or plugs and moisture barrier material.

(26)It is optional, but recommended that desiccant (C10-001) be placed on either side of the engine, but not in contact with the engine hardware.

NOTE : The desiccant (C10-001) should be replaced at regular intervals based upon the atmospheric and weather conditions. Therefore, they should be placed such that they will perform adequate protection to the engine.
The dessicant should be accessible for replacement without

disturbing the minimum amount of engine protective covering.

(27)Cover entire engine with a waterproof protective cover and secure tightly in place.

(28)Tag the engine to alert that the fuel system has been preserved per this procedure.

R F. Period Three Months to One Year - Non-Operable Engine

(1)Open thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

(2)If the engine can be motored, use procedure of an operable engine being
R preserved for three months to one year. If the engine cannot be motored, use the following procedure.

(3)Preserve Fuel System as follows :

(a)Drain fuel system from the following locations and catch in suitable containers.

1 Remove cap from fuel/oil heat exchanger fuel supply pressure port and let drain.

2 Disconnect fuel supply line and cap fuel pump inlet port.

3 Place Main Engine Control (MEC) power lever to the FORWARD position and place fuel shutoff lever to OPEN.

4 Remove fuel filter bowl and allow fuel to drain.

(b)Remove fuel pressure transmitter from fuel pump (Ref. 73-33-11, P. Block 401).

NOTE : Filter element may remain in filter head, take care not to damage element.

CAUTION : PRIOR TO PUMPING OF PRESERVATION OIL (CO2-025) TO POWER PLANT, TEMPERATURE OF SUPPLY OIL MUST BE BETWEEN 70°F (21°C) AND 120°F (49°C). AN INCORRECT TEMPERATURE OF THE PRESERVATION OIL WILL DAMAGE THE POWER PLANT.

(c)Ensure temperature of preservation oil (CO2-025) supply in oil pressurizing cart is between 70°F (21°C) and 120°F (49°C) before connecting oil pressurizing cart to fuel pump.

CAUTION : DO NOT USE ANY SILICONE BASE OILS OR PERMIT FUEL SYSTEM CONTAMINATION DURING CONNECTION OF OIL PRESSURIZING CART. SILICONE BASE OILS OR FUEL SYSTEM CONTAMINATION WILL DAMAGE THE ENGINE.

(d)Connect oil pressurizing cart to boost discharge pressure port of fuel pump, and pump preservation oil - not exceeding a flow pressure of 50 psig (3.45 bars) - into fuel pump until fuel free oil flows out of fuel/oil heat exchanger supply pressure port.

NOTE : If oil pressurizing cart is not available, a gravity flow container system connected to fuel pump inlet pad may be used providing the container is held 12 in.(305 mm) above the fuel pump.

(e)Disconnect pressurizing cart and install fuel pressure transmitter (Ref. 73-33-11, P. Block 401).

(f)Fill fuel filter bowl 1/2 full of oil (CO2-021) and install filter bowl.

(g)Connect pressurizing cart to the uncapped heat exchanger supply pressure port.

(h)Disconnect the line from the CIT sensor at the Pb port located at the 6 o'clock position on the MEC.

(i)Pump oil (C02-021) at 50 psig (3.45 bars) maximum pressure until fuel-free oil flows from the following ports in sequence :
NOTE : If oil pressurization cart is unavailable, a gravity flow container system connected to fuel pump inlet pad may be used. The container must be held 12 in.(305 mm) above the fuel pump.
1 CIT sensor return port to MEC; then cap port.
2 Return line from CIT sensor ; uncap port on MEC and reconnect the CIT sensor to MEC.
(j)Disconnect the pressurizing cart and recap the fuel/oil heat exchanger supply pressure port.
(k)Make certain all fuel system ports are capped, all lines connected and do not leak.

(4)Preserve lube system as follows :
(a)Preferred Method
1 Dry out and mist the engine per dry out procedure of this section.
2 Seal engine inlet and exit openings with moisture barrier material.
3 Cap or cover all strut, piping and accessory openings.
4 Cover entire engine with a waterproof protective cover and secure tightly in place.
(b)Alternate Method
1 Drain the engine oil from the following areas :
a Oil Tank
b Accessory Gearbox
c Transfer Gearbox
d Scavenge Filter
e Lube and Scavenge Pump
f Oil supply lines between lube and scavenge pump and the sumps and gearboxes
g Scavenge oil lines between lube and scavenge pump and sumps and gearboxes
h For the oil supply and the scavenge oil lines that are capped and do not connect back to the scavenge pump, remove the caps and drain any liquid from the lines.
2 Use a cart or hand pump from which quantities of engine oil can be measured. Pump a mixture of approved engine oil (C02-019) and at least seven percent by volume preservative (C02-051) into the following at a maximum pressure of 50 psig (3.45 bars).

Location	Oil Quantity
Oil supply to accessory gearbox	6 quarts (5.7 liters)
Oil supply to transfer gearbox	1 quart (0.95 liters)
Oil supply to A-sump	2 quarts (1.9 liters)
Oil supply to B-sump	1 quart (0.95 liters)
Oil supply to C-sump	1 quart (0.95 liters)
Oil supply to D-sump	1 quart (0.95 liters)
Oil tank	26 quarts (24.6 liters)
Lube and scavenge pump (Oil supply and scavenge discharge)	Wet parts
Scavenge filter bowl	1/2 pint (0.24 liters)

3 Cap all lube system ports, piping open ends, drains, vents, etc., to

seal off the entire lube system.

4 Any main engine bearings that are visible, use a plastic container of preservative oil (C02-025) and squirt a coating of oil on the bearing inner race and on the rollers, cage and outer race.

(c) Cover and seal the exposed sump areas with moisture barrier paper (C10-009).

(d) Cover and seal the open ends of each engine section with moisture barrier paper (C10-009).

(e) Tag sections of the engine that the lube system and fuel system have been preserved with preservation oil.

(f) Close thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

(g) Cover each section of the engine with a waterproof cover and secure it tightly to protect against foreign material and elements of the eather.

4. Preservation Renewal Requirements

R A. Period Up to 30 Days - Operable Engine

NOTE : There is no limit on the number of times this renewal can be accomplished.

R (1) Repeat the entire procedure of the original up to 30 days preservation procedure.

R B. Period Up to 30 Days - Non-Operable Engine

R (1) No renewal permitted, the engine should be preserved per the up to three months procedure.

R C. Period Up to Three Months - Operable Engine

R (1) No renewal permitted, the engine should be preserved per the three months to one year (operable engine).

R D. Period Up to Three Months - non-Operable Engine

NOTE : No renewal permitted, the engine components should be preserved

R per the Three months to one year procedure (Split Engine or Engine Modules).

R E. Period Three Months to One Year - Operable Engine

R (1) Repeat the entire procedure per the original 3 months to 1 year preservation procedure.

(2) Make certain that the engine is safely secured and protective cover is securely in place.

R F. Period 3 Months to One Year - Non-Operable Engine

(1) No renewal permitted, engine should be serviced and made operable.

5. Procedure for Exceeded Long Term Preservation Period

A. Operable Engine

CAUTION : SEE PARAGRAPH ON ENGINE TRANSPORTATION REQUIREMENTS. ANY DEVIATION FROM THESE REQUIREMENTS MAY RESULT IN ENGINE DAMAGE.

(1)An engine test run is required. The run may be accomplished with the engine installed in a test cell or on an aircraft.
(2)Use depreservation procedures for the engine, lube system and fuel system, (i.e., drain all preservation oil) and reservice lube system with approved oil and approved fuel to fuel system.
(3)Prepare for engine test run (Ref. 72-00-00, P. Block 501).
(4)After normal prestart checks, leak checks, start engine and permit to run
R at Ground Idle for a minimum of 15 minutes.
(5)Shut engine down and check lube system magnetic plug, scavenge and supply filters, and lube and scavenge pump inlet screens.
(a)If no debris is found - engine is serviceable.
(b)If debris is found - engine is NOT SERVICEABLE and must be repaired.

(6)Serviceable engine can then be preserved for the period for which it is to be placed in storage.

B. Split Engine - Non-Operable

CAUTION : TRANSPORT THE ENGINE, OR THE ENGINE MODULE THAT HAS A MAIN ENGINE BEARING, BY THE APPROVED METHOD ONLY, TO PREVENT DAMAGE TO THE ENGINE.

(1)Return engine to a location with test cell facilities for the CF6 engine.
(2)Assemble the engine.
(3)Depreserve the engine and the lube and fuel systems (i.e., drain all preservation oil) and reservice the lube system with approved oil and approved fuel to fuel system.
(4)Prepare for engine test run (Ref. 72-00-00, P. Block 501).
(5)After normal prestart checks, leak checks, start engine and permit to run at GROUND Idle for a minimum of 30 minutes.
(6)Shut engine down and check lube system magnetic plug, scavenge and supply filters, and lube and scavenge pump inlet screens.
(a)If no debris is found - engine is serviceable.
(b)If debris is found - engine is NOT SERVICEABLE and must be repaired.
(7)Serviceable engine can then be preserved for the period for which it is to be placed in storage.

C. Engine Modules

CAUTION : TRANSPORT THE ENGINE MODULE THAT HAS A MAIN ENGINE BEARING, BY THE APPROVED METHOD ONLY, TO PREVENT DAMAGE TO THE ENGINE.

(1)Move the module to a building and/or an area protected from dust, dirt and the weather elements.
(2)Remove the protective coverings.
(3)Visually examine the bearings that are visible for evidence of corrosion.
(a)Corrosion present, module is NOT SERVICEABLE and must be repaired.
(b)No evidence of corrosion - module is serviceable.
(4)Preserve serviceable module per the procedure for the storage period required.
(5)Make certain that all protective coverings are properly secured.

CAUTION : CORROSION DAMAGE DUE TO CONDENSATION FORMING ON LUBE WETTED PARTS (BEARINGS, GEARS, ETC.), SHALL BE PREVENTED BY DRYING OUT OIL WETTED AREAS AS SOON AS POSSIBLE FOLLOWING AIRCRAFT LANDING.

6. Engine Dry-Out Procedure.

A. General
(1)The following procedure is recommended whenever the engine has been :
- Engine-out ferried
- Aircraft pod transported
- Subjected to an In Flight Shut Down (IFSD)

(2)This procedure can be omitted if the engine is operated within 48 hours after landing. Operating the engine at ground idle for three minutes has the same effect as drying and lubricating the engine. The engine is thus
R preserved for up to 30 days.

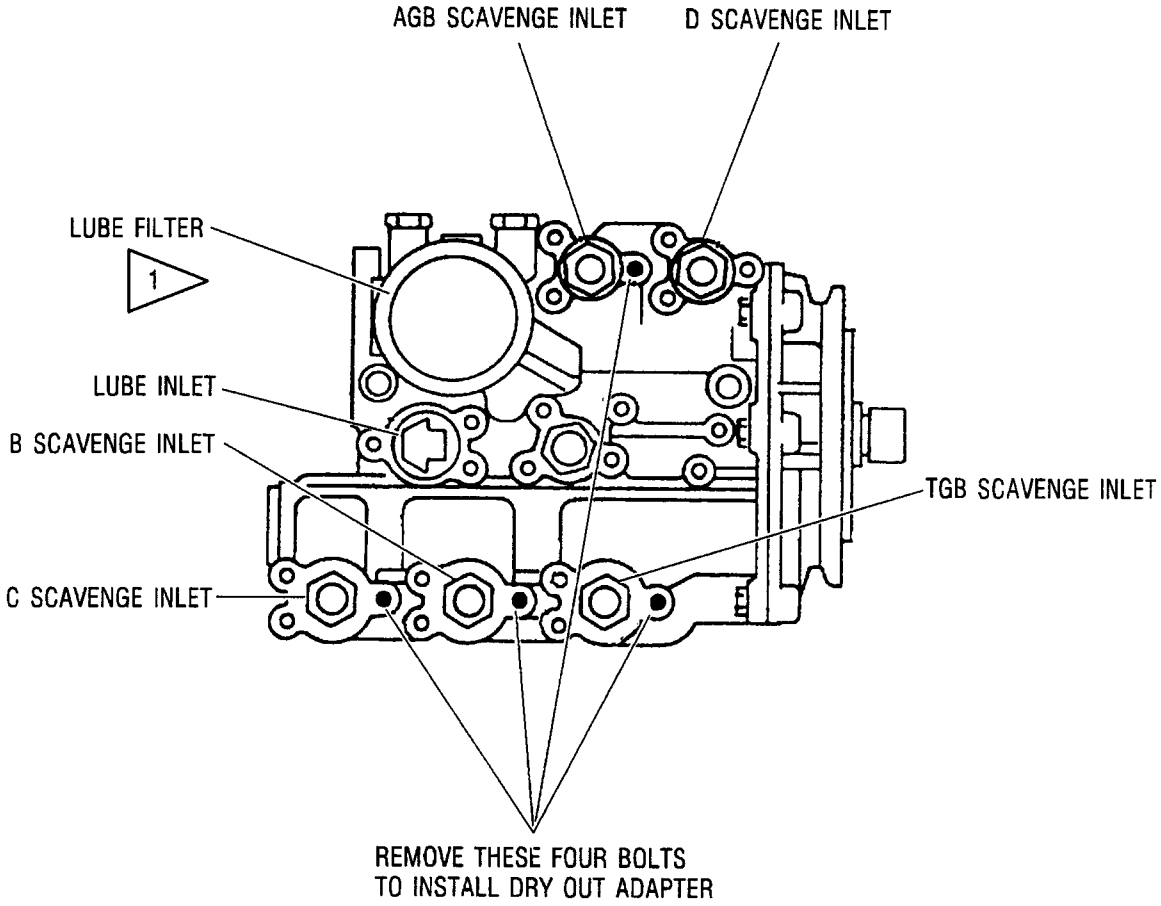
B. Dry-out Engine Using Adapter Kit, 2C8084G02, as follows :
(1)In the pressure container of dry-out adapter kit, mix solution of approximately 16.9 FL.OZ. (500 ml) preservative (C02-051) and 16.9 FL.OZ. (500 ml) approved engine oil (C02-019).
(2)Remove the fuel tube connecting the fuel flow transmitter to the IDG heat exchanger. Plug or cap the open ports.
CAUTION : DO NOT REMOVE ANY OTHER BOLTS THAN THOSE INDICATED IN FIGURE (Ref. Fig. 201) THIS COULD CAUSE THE LUBE AND SCAVENGE PUMP TO SEPARATE.
(3)Remove five scavenge screens and four bolts from the bottom of the lube and scavenge pump. (Ref. Fig. 201).
(4)Push dryout adapter up to lube and scavenge pump until bushings contact pump. Be careful not to pinch plastic tips on adapter.
(5)Secure adapter to pump with four attachment bolts. Apply a light torque to bolts after finger tightening.
WARNING : WEAR THERMAL GLOVES WHEN TURNING CORE ROTATING TOOL TO PROTECT HANDS FROM THE ESCAPING HOT AIR. HOT AIR CAN BURN YOU.
(6)Install core rotating tool, 2C14649G02 onto the accessory gearbox pad at the forward left side (forward looking aft).
(7)Connect pressure container inlet and exit hoses to adapter, 2C8084G02.
WARNING : HOT AIR WILL BE BLOWN FROM THE CENTER VENT TUBE. STAY CLEAR OF TUBE BY 20 FEET (6.1 M). HOT AIR CAN BURN YOU.
(8)Before connection start cart air hose to adapter, blow out air hose to clear any foreign matter.
(9)Connect start cart air hose to adapter making sure hose in snug reducing the forces being transmitted to lube pump during starting.
(10)Rotate the core and the fan a minimum of four times in 12 minutes. (If a borescope motor is used, operate at full speed.)
WARNING : IF THE FAN IS ROTATED BY HAND, GLOVES MUST BE WORN. THE FAN CAN CUT YOUR HAND.
(11)After drying engine for 12 minutes, turn valve that will allow the preservative mixture to flow through the engine. If possible, rotate core and fan four times during the next 3 minutes.
(12)When pressure container is empty (approximately 3-1/2 minutes), close valve.
(13)Turn off air start cart.
(14)Return engine to original condition.
(a)Remove air cart hose.
(b)Remove dry-out adapter.

(c)Reinstall the four bolts removed from the lube and scavenge pump. TORQUE to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN.).
(d)Install five scavenge screens and TORQUE to between 50 and 55 lbf.in. (0.56 and 0.62 m.daN.).
(e)Remove core rotating tool from the accessory gearbox pad and install cover plate. TORQUEnuts to between 55 and 70 lbf. in. (0.62 and 0.79 m.daN.).
(f)Assemble the fuel tube between the fuel flow transmitter and IDG heat exchanger.

C. Alternate Procedure of Engine Dry-Out. (No Adapter kit, 2C8084)
NOTE : As a minimum corrosive preventive procedure, it is recommended that hot dry air (325°F/163°C max) be applied through the tailpipe exhaust by utilizing locally fabricated ducting. Air sources may be an air start cart or a high flow space heater. Minimum dry-out cycle using this method is four hours.
(1)Remove the cover from the forward end of the accessory gearbox. Install the core engine motoring fixture, 2C14649, on the accessory gearbox pad.
(2)Assemble a locally fabricated ducting over the tailpipe and connect the hot air source to the ducting.
(3)Start the hot air source.
WARNING : USE CARE TO AVOID PERSONAL INJURY WHEN MANUALLY TURNING THE FAN ROTOR. ASSURE SAFE FOOTING. HEAVY PROTECTIVE GLOVES MUST BE WORN. THE FAN ROTOR CAN CUT YOUR HANDS.
(4)If possible, rotate the fan a minimum of four turns during dry-out, at equally spaced intervals.
(5)After at least four hours of drying, shut down hot air source, disconnect hose and remove ducting from tailpipe.
(6)If you installed the core engine motoring fixture, 2C14649, remove it from the accessory gearbox pad.
(7)Reinstall the cover plate to accessory gearbox. TORQUE nuts to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN.).
(8)After dryout cycle is completed, relubricate the oil wetted areas by motoring, or pressurize the lube system and rotate HP and LP systems during relubrication cycle.
NOTE : The addition of preservative (C02-051) to approved engine oil (C02-019) is not necessary if storage period is less than
R three months.

7. Depreservation Procedure

A. Depreserve the Engine as follows :
(1)Remove the engine from the shipping container (if preservation was for extended storage).
NOTE : Engine can be depreserved in shipping stand.
(2)Remove the moisture barriers and the seals from the engine openings.
(3)Remove dessicant (if used).
(4)Perform FOD check of engine inlet and exhaust areas for debris, fluids, etc.
(5)Drain all preservation oil (if it was used) from the oil tank (Ref. 79-00-00, P. Block 301).



1 GE SERVICE BULLETIN 79-047 DOES NOT USE THE LUBE FILTER. SERVICE BULLETIN 79-047 USES A NEW LUBE AND SCAVENGE PUMP ASSEMBLY THAT DOES NOT HAVE THE LUBE SUPPLY FILTER AND BYPASS AND SERVICE SHUT-OFF VALVES.

1027358-02-A

BM5 72 00 00 2 LAMO 02

Adapter Kit Installation
Figure 201

(6)Service the oil tank as required.
(7)Perform a wet start.
NOTE : If the engine is being removed from shipping configuration, 26 quarts (24.6 liters) of engine oil (C02-019) will be required to fill the lube system.

8. Removal/Installation of Engine Shipping Stand

A. Removal
The following procedure describes the removal of the engine from the engine shipping stand.
CAUTION : FRONT OF ENGINE MUST BE KEPT IN A POSITION SO THAT THE AFT SUPPORT ANTI-SWAY PIN AT 5 O'CLOCK POSITION IS FREE AT ALL TIMES. ANY BINDING CAUSES UNDESIRABLE BENDING LOADS ON THE TRF FLANGE.
(1)Using a hoist, attach engine lift fixture, 2C14130G02, to the engine.
(2)Remove two large retaining pins which secure the two forward mount assembly adapters to the engine cradle.
(3)Remove retaining pin from anti-sway bar and move clevis end away from lug on LPT/TRF flange at the 5 o'clock position, aft looking forward.
(4)Remove ball lock retaining pins from aft mount pin clamp bars at the 3 and 9 o'clock positions then swing the clamp bars aft to the open position.(Ref. Fig. 204).
(5)Raise the engine being careful to keep the engine level until clear of stand.
NOTE : To prevent the possibility of binding between the aft mount pins and mount adapters while raising the engine, station a man at each side to keep the pins aligned with the socket holes in the TRF until clear of the adapters.
(6)Remove the aft mount pins from sockets in TRF when clear of mount adapters.
(7)Remove the 2 pins which secure the forward mount adapters to the ground handling mounts in fan case T-rings at the 4 and 8 O'clock positions.
(8)Remove the safety pins securing the 4 forward mount sliding pins to the stationary pins and slide the pins together. Remove the forward adapters. (Ref. Fig. 202, 203).
(9)Install engine into work station.
(10)Remove engine lift fixture, 2C14130G02.

B. Installation
The following procedure describes the installation of the engine into the engine shipping stand.
(1)Attach lift fixture, 2C14130G02, to the engine and adjust for engine center of gravity.
(2)Remove the bolts and washers securing the overboard drain mast to the bottom of the fan case lower pylon barrier.
(3)Remove a bolt and nut securing a wire bundle hinge clamp to the aft fan case at the 6 o'clock position.
(4)With the engine aligned and positioned above the shipping stand, install the forward mount adapters to the aft fan case ground handling mounts as follows.

(Ref. Fig. 202)

(a)Position the upper end of the forward mount adapters between the aft fan case T-rings at the 3 and 9 o'clock ground handling mounts.

(b)Push the four sliding pins outward into the mount bushings. Secure each sliding pin into place with a retaining pin inserted through the stationary pin.

(c)Swing the lower end of the forward mount adapter inward and align with the 4 and 8 o'clock ground handling mounts.

1 Secure lower end of adapter to fan case using retaining pin.

2 Secure retaining pin in place with a safety pin.

(d)Apply a light coat of lubricant (CO2-058) to the lower (bayonet) end of the forward mount adapter.

(5)Apply a light coat of lubricant (CO2-058) to the aft mount adapter guides and to the small pin end of the mount pin.

(6)Insert the aft mount pins into ground handling mount sockets located in the TRF at the 3 and 9 o'clock positions until the pin bottoms against the TRF boss.

NOTE : The aft mount pin equipped with threads and locking collars is to be installed at the 9 o'clock position.

(7)Carefully lower the engine into the shipping stand while looking for the following :

(a)Alignment of the forward mount adapters with the holes at the forward end of the cradle rails.

(b)Alignment of the slots in the aft mount pin blocks with the guides of the aft mount adapter yokes while holding the two aft mount pins against the TRF bosses. If the aft mounts do not align refer to Para. 8.

(c)The bottoming of both the forward and aft mount adapters into the respective receptacles.

(8)Adjust the aft mount pin for proper alignment as follows :

(a)Loosen the setscrews of the two locking collars on the 9 o'clock aft mount pin.

(b)Maintaining the position of the 3 o'clock aft mount pin, adjust the threaded mount pin so the slots in the pin blocks align with the guides of the aft mount yoke.

(c)Tighten the locking collars against the mount pin blocks finger-tight. Tighten the collar setscrews until snug and wirelock the collars to the mount pin.

(9)Swing the aft mount clamp bars over the mount pins and secure with retaining pins. Secure retaining pins with safety pins.

(10)Insert 2 retaining pins through the cradle side rails beneath the forward mount adapters. Secure with retaining pins and safety pins.

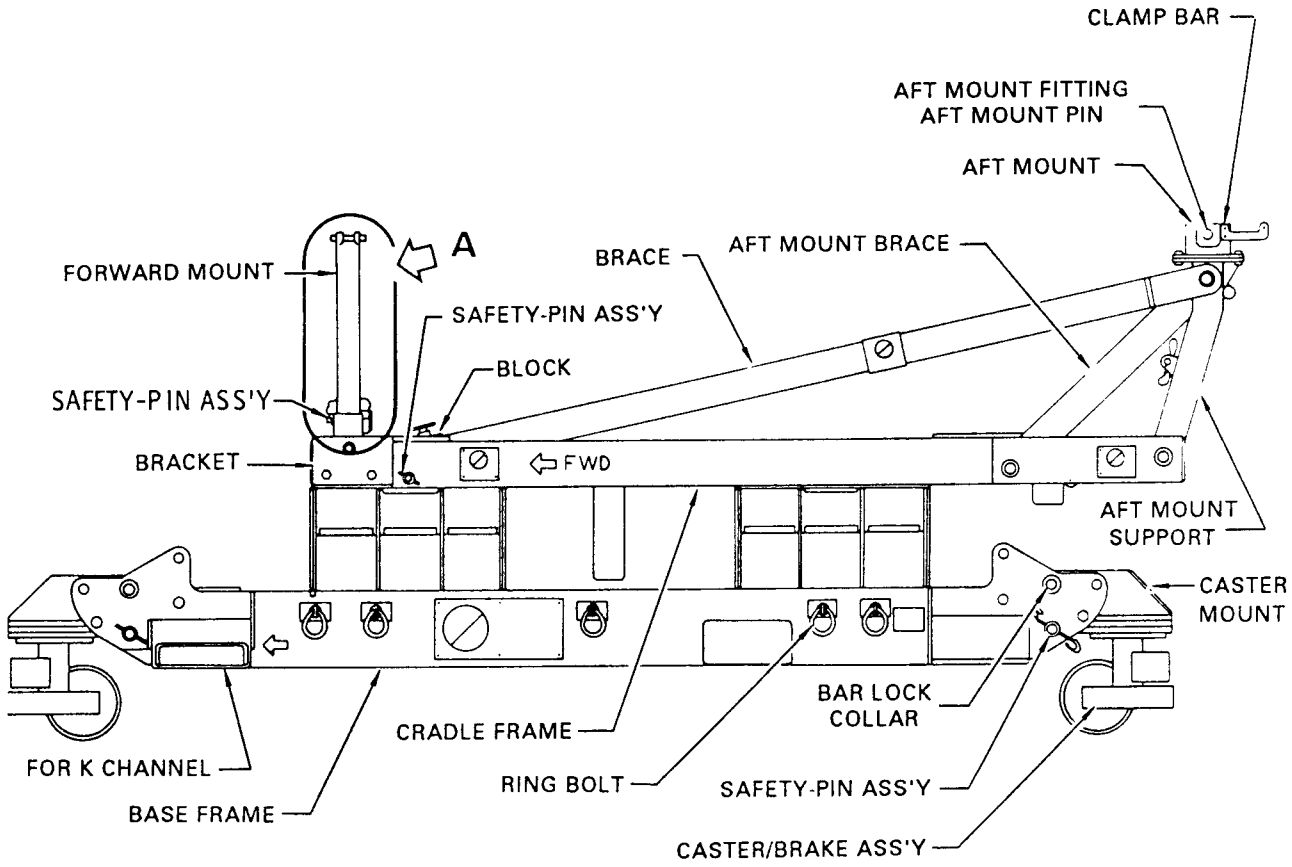
(11)Align the anti-sway bar with the ground handling bracket lug at the 5 o'clock position (aft looking forward) on the LPT/TRF flange. Secure the anti-sway bar to the bracket with a retaining pin and safety pin.

(12)Remove the engine lift fixture, 2C14130G02.

C. Transportation of Engine

The following instructions provide the requirements that apply when transporting an engine or any module that contains bearings.

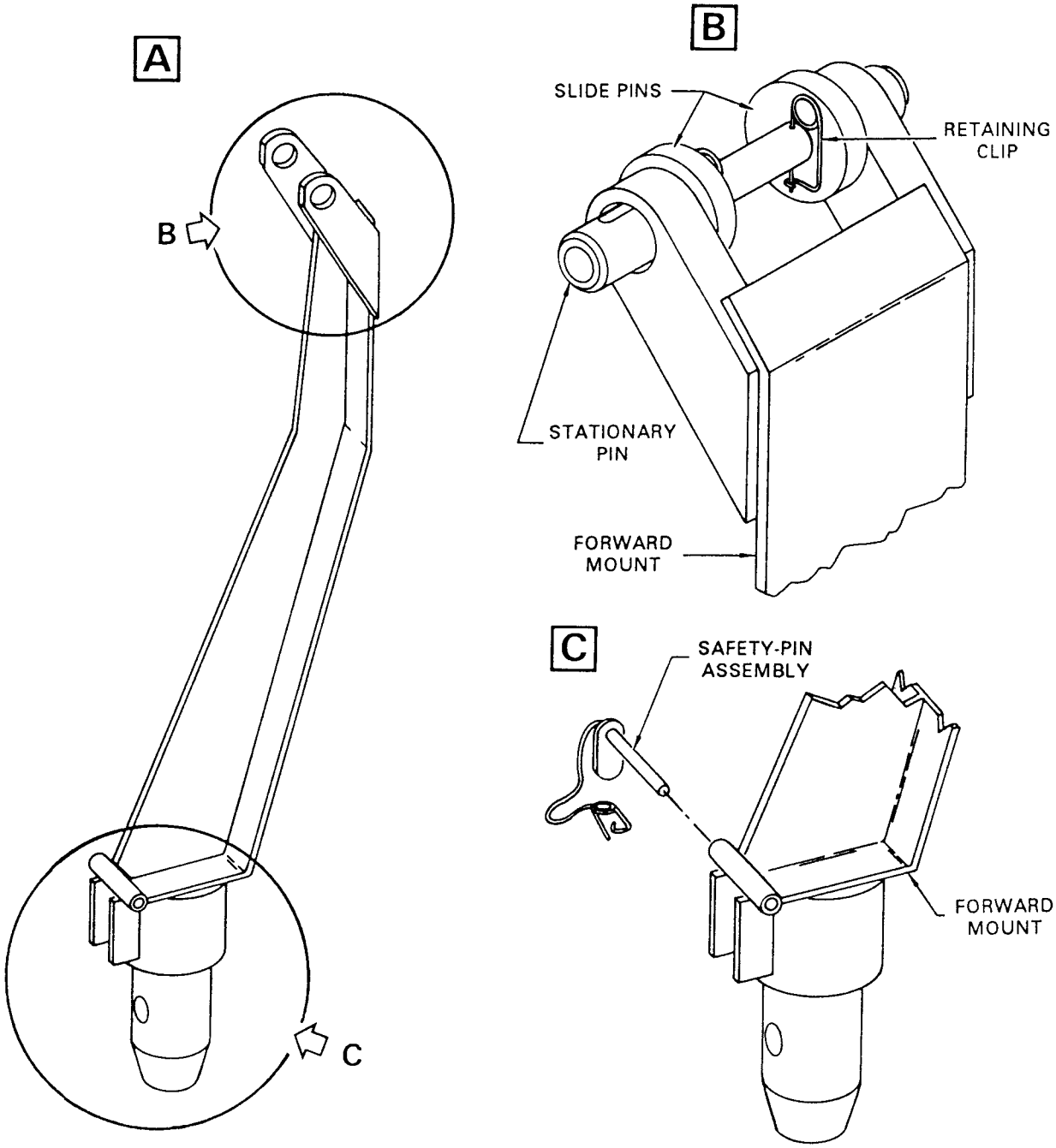
CAUTION : SHIPPING STAND MUST MEET THE REQUIREMENTS OF GENERAL



CF8-C3635-00-A

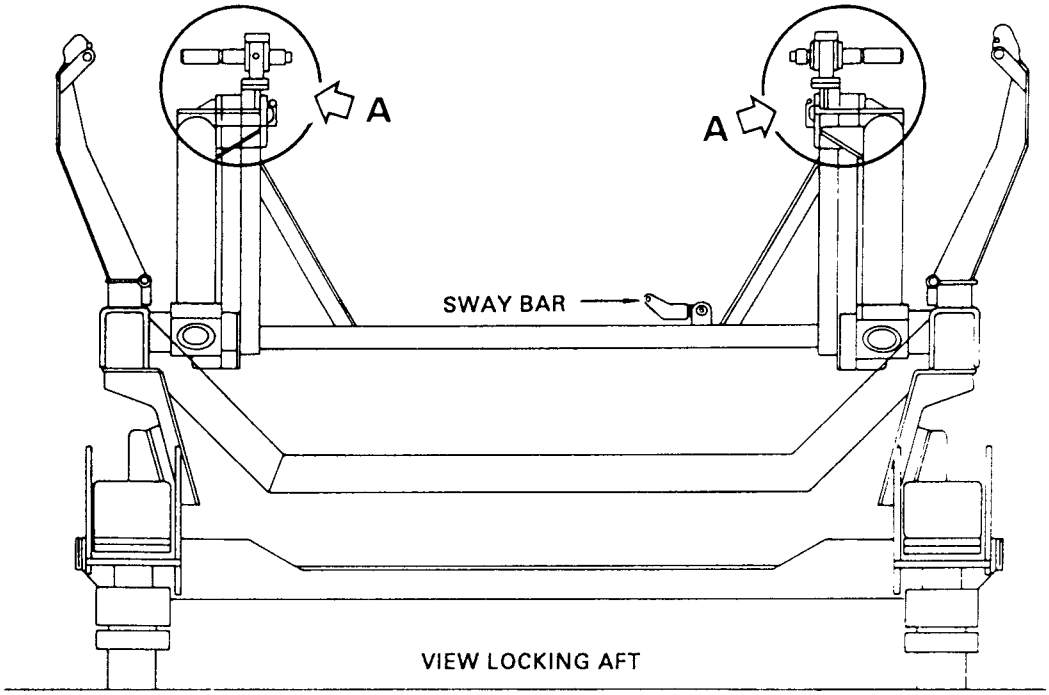
BM5 72 00 00 2 LCMO - 00

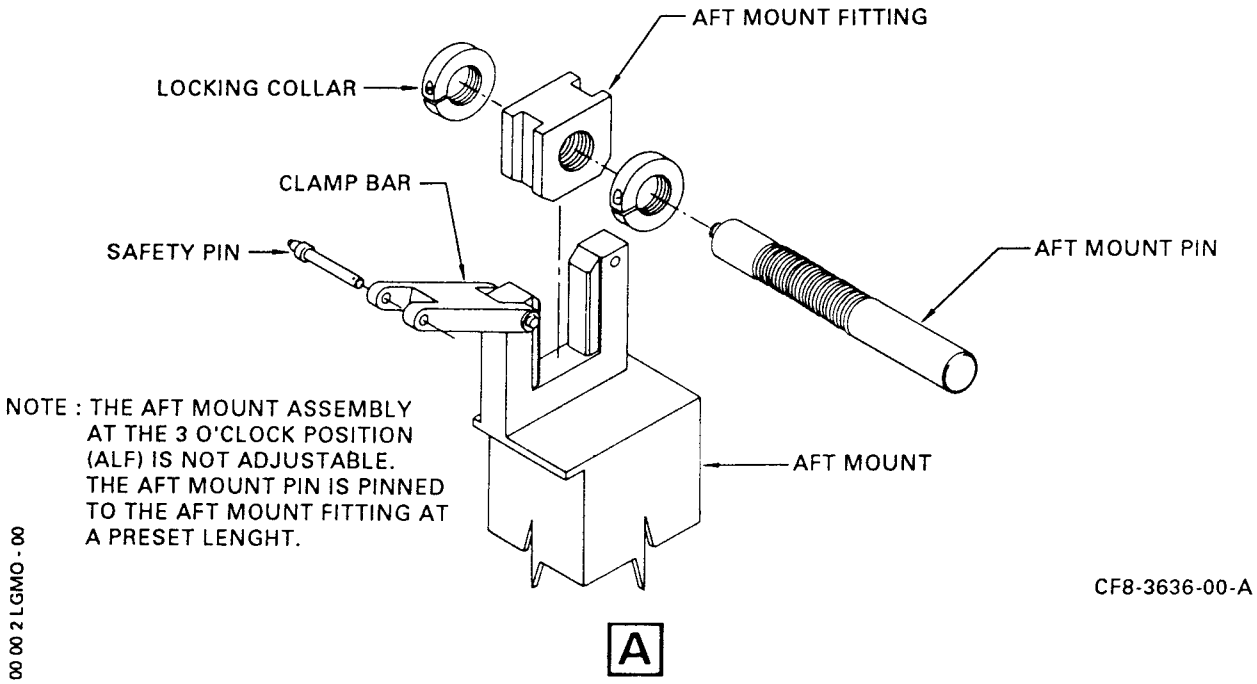
Engine Shipping Stand (Fwd Support-Detail)
Figure 202



BM5 72 00 00 2 LEMO - 00

Engine Shipping Stand (Fwd Support-Detail)
Figure 203




AFT MOUNT FITTING
LOCKING COLLAR
CLAMP BAR
SAFETY PIN
AFT MOUNT PIN
AFT MOUNT
NOTE : THE AFT MOUNT ASSEMBLY AT THE 3 O'CLOCK POSITION (ALF) IS NOT ADJUSTABLE. THE AFT MOUNT PIN IS PINNED TO THE AFT MOUNT FITTING AT A PRESET LENGHT.
CF8-3636-00-A
A
BM5 72 00 00 2 LGMO - 00

Engine Shipping Stand (Fwd Support-Detail)
Figure 204

ELECTRIC SPECIFICATION M50TF1338, LATEST REVISION, TO PROVIDE PROTECTION FROM SHOCK AND VIBRATION LOADS THAT MAY BE IMPOSED.

CAUTION : ANY DEVIATION FROM THIS TRANSPORTATION REQUIREMENTS MUST BE REFERRED TO THE GENERAL ELECTRIC COMPANY FOR ENGINE DISPOSITION.

(1)In-Plant Transportation.

CAUTION : USE CARE WHEN HANDLING AND TRANSPORTING THE ENGINE. DAMAGE MAY OCCUR IF BEARINGS ARE SUBJECTED TO EXCESSIVE "G" LOADS.

(a)Less than 0.5 mph (0.8 km/hr) - no special vehicle requirement.

(b)One-half to 3 mph (0.8 to 4.8 km/hr) - vehicule must have spring-loaded shock absorbing wheels. Tires should be either pneumatic or of resilient materials.

(c)Three to 5 mph (4.8 to 8.0 km/hr) - vehicle must have shock and vibration absorbing systems which isolate or damp out frequencies of 15 Hz and above.

(2)Highway Transportation.

CAUTION : FAILURE TO USE PNEUMATIC SUSPENSION AS INDICATED BELOW MAY RESULT IN SEVERE ENGINE DAMAGE REQUIRING EXTENSIVE REPAIR.

(a)Attachment to Trailer.

CAUTION : TO ENSURE THAT THE VIBRATION DAMPENING FEATURE OF THE SHIPPING STAND IS NOT NULLIFIED, THERE MUST BE A MINIMUM CLEARANCE OF 1.5 INCHES (38 MM) BETWEEN THE LOWEST PART OF ENGINE OR SHIPPING STAND CRADLE AND TRAILER BED. WOOD SHORING CAN BE PLACED BENEATH THE STAND BASE AND TRAILER BED IN ORDER TO ACHIEVE THE REQUIRED MINIMUM CLEARANCE.

CAUTION : TIE-DOWN CHAINS AND STRAPS MUST BE INSTALLED PROPERLY AND ATTACHED SOLELY TO TIE-DOWN RINGS. IF IMPROPER TIE-DOWN IS PERFORMED, THE VIBRATION DAMPENING FEATURE OF THE SHIPPING STAND SHOCK MOUNTS WILL BE NULLIFIED RESULTING IN ENGINE BEARING DAMAGE FROM EXCESSIVE "G" LOADS.

1 The engine stand base must be anchored onto the trailer bed by tie-down straps or chains.

NOTE : There are 8 tie-down rings on the base. Any combination can be used. However, the end rings located at the four inside corners of the stand base is recommended.

CAUTION : FOR OPERATOR CLARIFICATION OF TIE-DOWN PROCEDURE, VARIOUS IMPROPER TIE-DOWN TECHNIQUES ARE SHOWN IN FIGURE (Ref. Fig. 206). UNDER NO CIRCUMSTANCES SHOULD THESE TIE-DOWN METHODS BE USED. YOU CAN DAMAGE THE ENGINE IF YOU DO NOT USE THE CORRECT ENGINE TIE-DOWN PROCEDURES.

CAUTION : THE VIBRATION DAMPENING FEATURE OF THE SHIPPING STAND WILL BE NULLIFIED IF OBSTRUCTED BY LOOSE ENDS OF TIE-DOWN CHAINS. LOOSE ENDS OF TIE-DOWN CHAINS MUST BE KEPT CLEAR FROM ON AND UNDERNEATH OF THE SHIPPING STAND. YOU CAN DAMAGE THE ENGINE IF YOU DO NOT KEEP THE LOOSE ENDS OF THE TIE-DOWN CHAINS CLEAR OF THE UNDERNEATH OF THE SHIPPING STAND.

2 Attach the tie-downs to the rings and pull them diagonally across the truck bed. Secure the tie-downs to anchoring points on trailer

bed (Ref. Fig. 205). Pull all tie-down chains or straps taut and secure.

3 Ensure that engine stand assembly is anchored to the transportation trailer by the proper tie-down points on shipping stand base.

(b)Shipment by Semi-trailer.

NOTE : Minimum required clearance between engine or shipping stand cradle and trailer bed must be 1.5 inches (38 mm).

1 Single engine mounted over trailer axle - trailer must be pneumatically suspended.

2 Two or more engines - both tractor and trailer must be pmeumatically suspended.

(c)Shipment by towed trailer or wagon-bed truck - both axles must be pneumatically suspended.

(3)Water transportation.

Shipping stand must meet requirements of GE specification M50TF1338, to provide protection from shock and vibration loads that may be imposed.

(4)Air Cargo Transportation.

CAUTION : NORMAL SHOCK ABSORBING EQUIPMENT IS REQUIRED FOR TRANSPORT OUTSIDE OF AIRCRAFT. YOU CAN DAMAGE THE ENGINE IF YOU DO NOT USE SHOCK ABSORBING TRANSPORTATION EQUIPMENT.

Shipping stands meeting the requirements of GE Specification M50TF1338, latest revision, are preferred. GE approved shipping stands which omit the normal shock aborbing equipment are acceptable for air transport only.

(5)Rail Transportation.

Shipment by rail is not recommended. Consult General Electric Company for recommended dynamic test of proposed shipping method.

9. Removal/Installation of Shipping Cover, 2C14808 or 2C14114

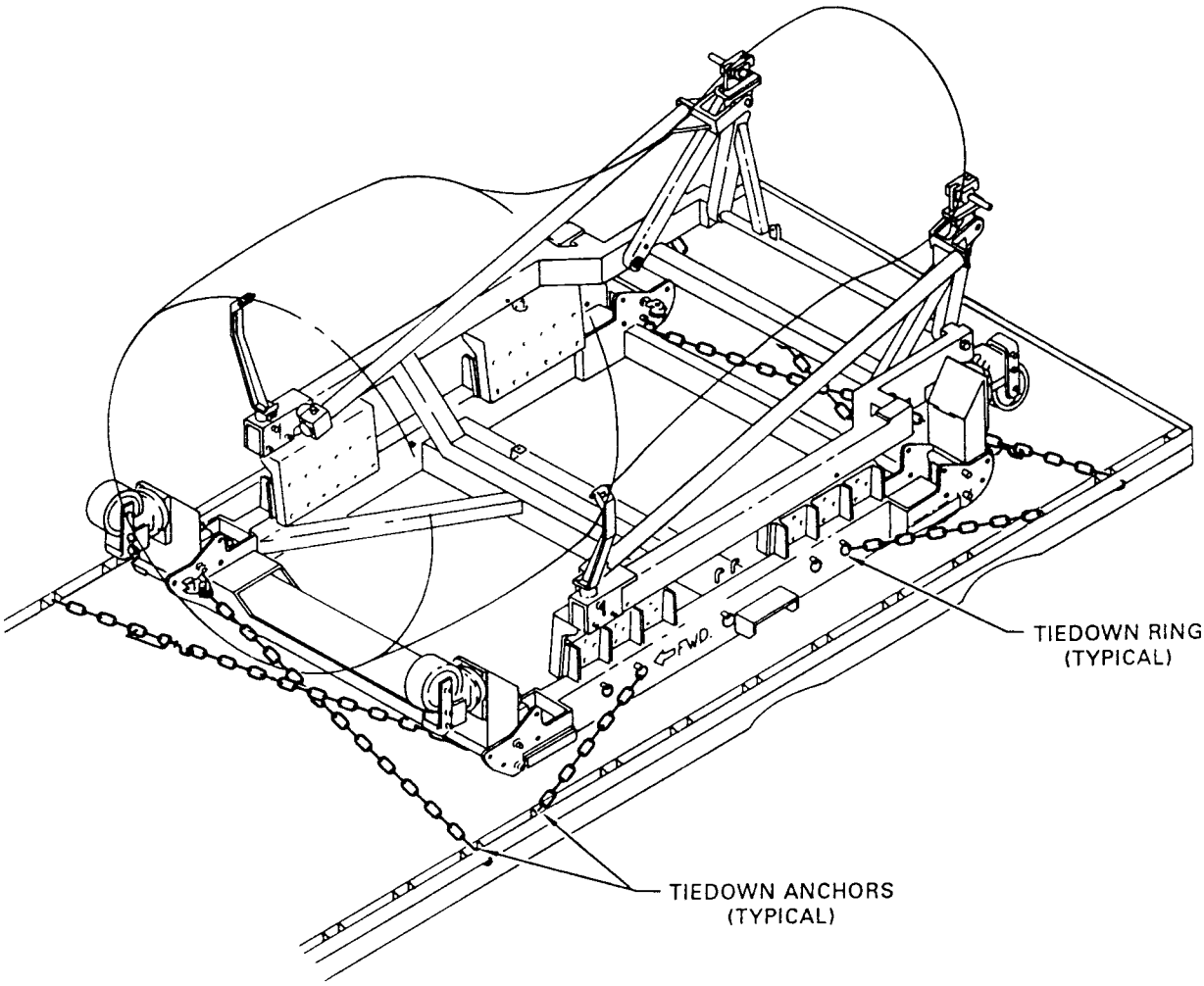
A. Remove shipping cover as follows :

(1)Remove engine forms from pocket at 8 o'clock position near aft end of cover.
(2)Peel VELCRO flaps open and loosen drawstrings around front and rear mounts.
(3)Unsnap fasteners under flap.
(4)Remove quick disconnect pin at 6 o'clock on LPT stator flange.
(5)Remove shipping cover duffle bag from inside cover.
(6)Pull bottom of cover aft under engine.
(7)Pull top of cover aft over engine.
(8)Remove plastic sheets from engine.
(9)Remove all padding from engine.
(10)Fold cover and store in duffle bag.

B. Install shipping cover as follows :

(1)Seal front and rear engine openings with a 4 mil (0.004 in. (0.1 mm)) plastic sheet (C10-128).
(2)Pad engine with urethane foam (C01-025) to protect cover from being damaged by sharp edges.
(3)Cover sharp edge of seal channel at 12 o'clock position on aft fan case using split piece of 0.75 in. (19.1 mm) diameter plastic hose. Place

PROPER TIEDOWN

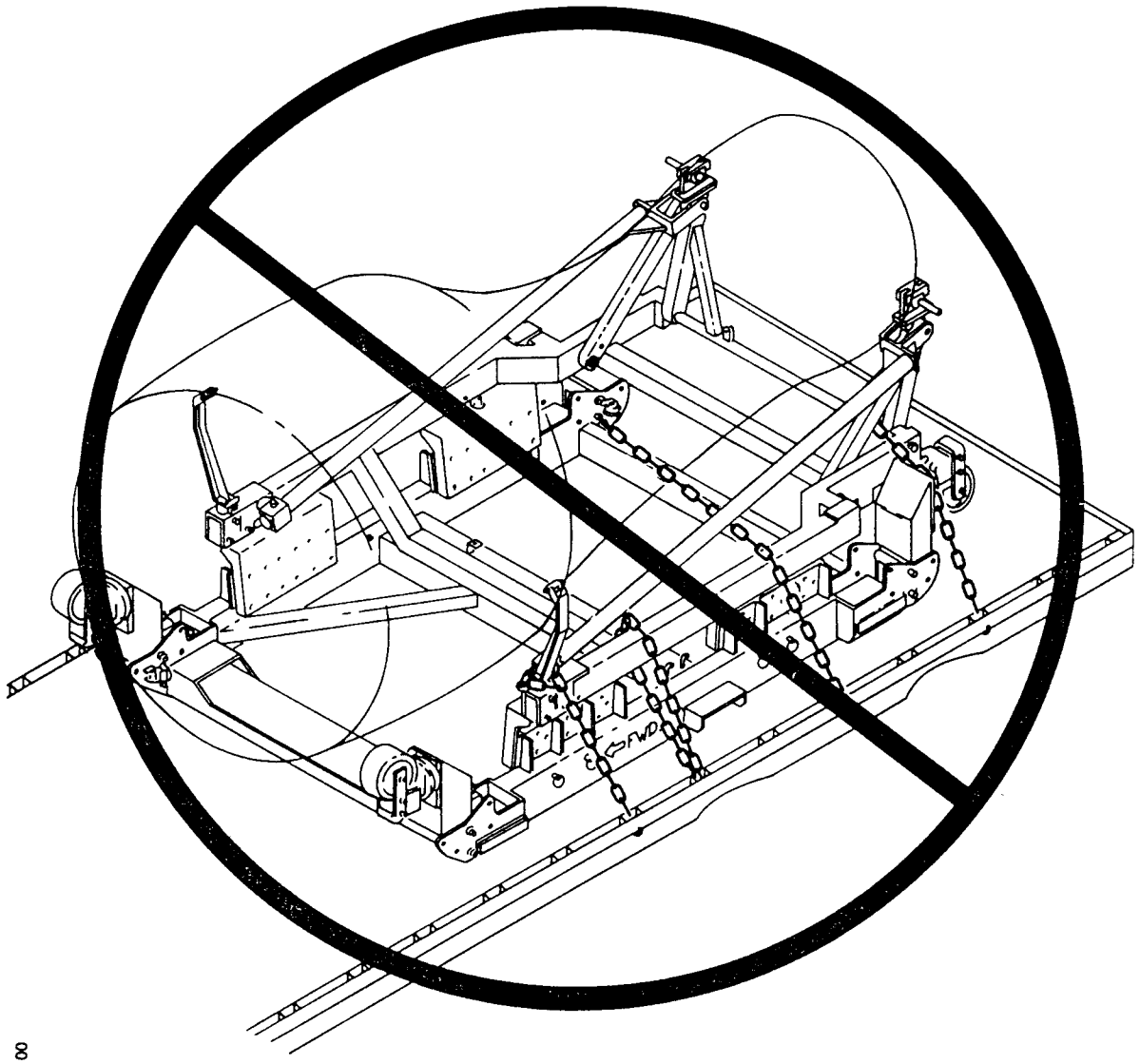


CF8-C3637-00-A

BM5 72 00 00 2 LJMO - 00

Proper Tiedown of Shipping Stand
Figure 205

IMPROPER TIEDOWN



CF8-C3638-00-A

BM5 72 00 00 2 LLMO - 00

Improper Tiedown of Shipping Stand
Figure 206

thick block of foam in channel to support cover.

(4) Seal the fan exit area with a 4 mil (0.004 in. (0.1 mm)) plastic sheet (C10-128).

(5) Remove cover from duffle bag and unfold.

(6) Remove quick disconnect pin at 6 o'clock position on LPT stator flange, pull bottom of cover forward under engine to align holes and insert pin.

(7) Pull cover forward over top of engine.

(8) Place duffle bag in bottom of cover and fasten top and bottom of cover together with snap fasteners.

(9) Tighten and tie drawstrings at engine mounts and close VELCRO flaps by pressing together.

(10) Put engine forms in pocket at 8 o'clock position near aft end of bag ; seal flap.

1. General
This section contains minimum required adjustment/test procedures that must be performed on-wing of the aircraft after an engine component has been replaced to ensure a completely operable engine. Testing procedures are divided into categories of maintenance called functional checks, each evaluating a particular engine segment to convert fan and core percentage speeds to actual rpm, respectively (Ref. 71-00-00, P. Block 501).

2. Equipment and Materials

A. Standard Equipment
(1)Protective Mat - Rubber Mfg's. Association, Grade SC43, neoprene sponge, 1 in. (25.4 mm) thick, approximately 3 x 4 feet (0.9 x 1.2 m) with warning streamers attached (3 required) - Trim Balance.
(2)Paper - PolarGraph, Commercially available - Trim Balance.

B. Equipment and Materials

ITEM	DESIGNATION
(1)Material No.C02-058	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
(2)2C14963	Kit, Engine Trim Balance
(3)2C14965	Analyser, Engine Trim Balance
Referenced Procedures	
- 71-00-00, P. Block 501	Power Plant - General
- 77-32-01, P. Block 401	Alternate/External No. 1 Bearing Accelerometer
- 77-32-03, P. Block 401	CRF External Accelerometer

3. Safety Precautions
Refer to 71-00-00, P. Block 501

4. Function/Check Guide (Ref. Fig. 501)
A quick reference, schedule, function/check guide determines what engine adjustment/tests are required. It lists recommended check for items that have been removed/installed on-wing. Generally, only one or two functional checks need to be made on an engine. However, since an operator may choose to conduct an after maintenance check on-wing in lieu of a test cell procedure, the schedule lists checks required after removal/installation of an engine assembly or a major component which was accomplished off-wing. To ensure that engine operation is not jeopardized by interface connections, it should be remembered that additional checks are required by the operator or aircraft maintenance manual.

A. Motoring Check
CAUTION : REFER TO CHAPTER 71-00-00, P. BLOCK 501 FOR WIND RESTRICTIONS DURING ENGINE OPERATION.
CAUTION : PRIOR TO STARTING ENGINE, CHECK TO SEE THAT THE REVERSE THRUST

CAUTION:

ENGINE-TO-AIRCRAFT INTERFACE CONNECTIONS ARE CUSTOMER RESPONSIBILITY. TAKE PROPER PRECAUTIONS TO ENSURE ENGINE OPERATION IS NOT JEOPARDIZED.

NOTE:

POWER ASSURANCE, VSV TRACKING AND VIBRATION CHECKS ARE NOT REQUIRED IF ENGINE HAS BEEN TESTED AND ACCEPTED IN AN APPROVED TEST CELL AFTER MAINTENANCE ACTION.

ITEM REMOVAL/INSTALLATION	DRY MOTORING	WET MOTORING	START	IDLE CHECK	VIBRATION CHECK	VSV TRACKING CHECK	POWER ASSURANCE CHECK	ENGINE SHUTDOWN	
ENGINE REMOVAL/INSTALLATION					X				
FAN/CORE SEPARATION					X	X		X	
EMU/ASSY - REMOVAL/INSTALLATION									
FAN SECTION AND ACCESSORY DRIVE EMU					X	X		X	
FAN FRAME/STATOR/INLET GEARBOX EMU					X	X		X	
FAN FORWARD/MID-SHAFT EMU					X	X		X	
FAN ROTOR/STAGES 2 AND 3 STATOR EMU					X	X		X	
FAN STATOR ASSY					X	X		X	
FAN FRAME AND CASE ASSY					X	X		X	
COMPRESSOR ROTOR ASSY					X	X		X	
COMPRESSOR REAR FRAME ASSY					X	X		X	
COMBUSTOR LINER ASSY					X	X		X	
HPT ROTOR/2ND STAGE TURBINE NOZZLE EMU					X	X		X	
LPT SECTION EMU					X	X		X	
LPT ROTOR/STATOR/REAR FRAME EMU					X	X		X	
FIRST STAGE HPT NOZZLE ASSY					X	X		X	
SECOND STAGE HPT NOZZLE ASSY					X	X		X	
LPT ROTOR ASSY					X	X		X	

1025839-01-A

BMS 72 00 00 5 LAMO - 01

Function/Check Guide
Figure 501

LEVERS ARE IN STOWED POSITION AND THRUST REVERSERS ARE FUNCTIONALLY CLEARED TO STOW.

CAUTION : DO NOT EXCEED OPEN COWLING LIMITATIONS DURING TESTING.

CAUTION : OPERATOR MUST BE THOROUGHLY FAMILAR WITH OPERATING LIMITS BEFORE RUNNING ENGINE.

CAUTION : IF THRUST REVERSERS ARE CYCLED DURING AN ENGINE CHECK, OBSERVE THE FOLLOWING PRECAUTIONS :
DO NOT EXCEED 40 PERCENT N1.
DO NOT EXCEED RATE OF ONE REVERSER CYCLE PER 90 SECONDS INTERVAL.
DO NOT EXCEED ONE MINUTE WITH REVERSER DEPLOYED.
RESTRICT REVERSER OPERATION TO FIVE CONSECUTIVE CYCLES FOLLOWED BY A 30 MINUTE COOLING PERIOD.

(1)Prestart Check
Prior to motoring the engine, for any purpose, perform the following steps :
(a)Make certain that engine is clear of equipment, personnel, tools and other foreign objects.
(b)Make certain that air intake and exhaust areas are free from obstructions and foreign objects, including ice.
(c)Check for condition of visible parts of the fan and engine inlet area. Pay particular attention to fan blades.
(d)Check the fan reverser system for condition, security of parts and proper stowage.
(e)Check external surfaces of cowl and drain ports for evidence of fuel and oil leaks.
(f)Check oil level in oil tank. Service if required.
(g)Check operation of ignition systems. Properly operating igniters give 1 to 5 sharp cracking sounds per second.
NOTE : The ignition system check indicates circuit continuity and operation but does not assure spark energy is adequate for ignition.
(h)If an engine has been exposed to freezing rain or snow, check for ice or snow accumulation in the fan section or in the low pressure turbine areas. When an accumulation occurs check the fan for free rotation. If rotation is hindered by ice or snow, heat areas affected with hot air prior to starting engine.

B. Vibration Check
(1)Obtain vibration readouts from the following locations :
(a)Fan Rotor (N1).
1 Primary - The No.1 bearing accelerometer is located internally in the No.1 bearing housing.
2 Alternate - The accelerometer is mounted externally on the fan frame between struts 4 and 5. For installation procedures (Ref. 77-32-01, P. Block 401).
NOTE : Sensitivity setting for either accelerometer is 50 pC/g.
(b)Core Rotor (N2) - The CRF accelerometer is located approximately at the 10:30 o'clock position, aft looking forward, on the compressor rear stator to CRF flange. For installation procedures (Ref. 77-32-03, P. Block 401).

CAUTION : TO AVOID CHOOSING WRONG CHECKOUT TARGET, DO NOT USE AIRCRAFT TOTAL AIR TEMPERATURE INDICATION FOR AMBIENT AIR TEMPERATURE.

CAUTION : DO NOT TAKE MERCURY THERMOMETER ON BOARD AIRCRAFT. IF THERMOMETER BREAKS, MERCURY THAT TOUCHES AIRCRAFT COMPONENTS COULD RESULT IN DAMAGE TO COMPONENTS.

(2)Find and record ambient air temperature (outside air temperature (OAT)) using thermometer. Take reading in shaded area of airplane.

(3)Find and record N1 target for the current OAT (Ref. Fig. 502).

(4)Conduct vibration survey as follows :

R (a)Obey the safety and operating precautions as described in Paragraph 3.
R (Ref. 71-00-00, P. Block 501).

R (b)Make sure that the wheel chocks CHOCK-MLG, ENGINE RUN-UP
R (98F10103500000) are in position in front of each forward MLG wheel.

R (c)There must be two qualified persons in the cockpit when performing an
R engine run above idle. One must monitor the outside and the aircraft
R behaviour while the other performs the engine test.

R (d)If the aircaft begins to move while performing an engine run,
R immediately set all the thrust levers to idle position.

R (e)Start engine and stabilize at Minimum Idle for 5 minutes.

R (f)Perform a 2-minute accel from Minimum Idle setting to a Maximum Power Assurance setting; then followed by a 2-minute decel. Monitor vibration readings and record rpm at peak indication.

R (g)Stabilize at Minimum Idle for 5 minutes.

R (h)Shut down engine.

(5)Check the results with the vibration limits mentioned in TSM 77-32-20 and perform trouble shooting procedure if necessary.

C. Fan Trim Balance - General

The fan trim balance check contains procedures to balance the installed fan rotor provided fan vibration does not exceed 15 mils indication on No. 1 bearing accelerometer.

NOTE : All reference to clock positions and direction of rotation are viewed in the forward looking aft direction, unless otherwise indicated.

(1)Trim balance procedure

The trim balance procedure contains two distinct and separate methods of trim balancing an installed fan rotor. The selection of either Method 1 or Method 2 depends upon the availability of the trim balance analyzer.A brief description and use of each method is described as follows:

(a)Analyzer Method requires the use of kit 2C14963 and vibration analyzer 2C14965 to read the vibration amplitude and phase angle from the No. 1 bearing (or alternate) accelerometer, and N1 speed. The location to place the first balance weight is determined by a matrix (table) of phase angle versus location. If the balance is not satisfactory after the first run with weights added, then the amplitude and phase angle of the first run is compared to the original run data by vector analysis to determine amount and location to place subsequent correction weights.

(b)Method 2, the 3-shot plot, is utilized when a trim balance analyzer is not available. The 3-shot plot uses the aircraft vibration system for

T2 DEGC	N1 PCT	T2 DEGC	N1 PCT	T2 DEGC	N1 PCT
-40	86.8	-10	92.2	20	97.3
-39	87.0	-9	92.4	21	97.5
-38	87.2	-8	92.6	22	97.7
-37	87.4	-7	92.7	23	97.8
-36	87.5	-6	92.9	24	98.0
-35	87.7	-5	93.1	25	98.2
-34	87.9	-4	93.3	26	98.3
-33	88.1	-3	93.4	27	98.5
-32	88.3	-2	93.6	28	98.7
-31	88.5	-1	93.8	29	98.8
-30	88.6	0	94.0	30	99.0
-29	88.8	1	94.1	31	99.1
-28	89.0	2	94.3	32	99.3
-27	89.2	3	94.5	33	99.5
-26	89.4	4	94.6	34	99.6
-25	89.6	5	94.8	35	99.8
-24	89.7	6	95.0	36	100.0
-23	89.9	7	95.2	37	100.1
-22	90.1	8	95.3	38	100.3
-21	90.3	9	95.5	39	100.4
-20	90.4	10	95.7	40	100.6
-19	90.6	11	95.8	41	100.8
-18	90.8	12	96.0	42	100.9
-17	91.0	13	96.2	43	101.1
-16	91.2	14	96.3	44	101.2
-15	91.3	15	96.5	45	101.4
-14	91.5	16	96.7	46	101.6
-13	91.7	17	96.8	47	101.7
-12	91.9	18	97.0	48	101.9
-11	92.0	19	97.2	49	102.0
				50	102.2

BM5 72 00 00 5 LXM0 00

1025272-00-A

Vibration Survey Power Setting Table
Figure 502

fan rotor balance weight selection and placement.

(c)Definition of Terms and Symbols

1 Imbalance amplitude (U) - measured by the No.1 bearing or FCCM accelerometer and expressed in units of displacement (mils).

2 Phase angle (A) - indicated on trim balance analyzer and expressed in degrees.

3 Weight (W1, W2, W3, etc.) - a balance correction weight in grams comprised of a balance screw (or screws) which mounts in the spinner cone.

4 R - the resulting imbalance due to attached weight. R1 is the resultant imbalance due to W1 ; R2 is the resultant imbalance due to W2, etc.

5 Angle X - the circumferential error of attached weight location measured between R and U, with its clock direction determined from R to U.

6 Correction Weight Factor - amount of balance weight required to correct one mil of imbalance. Different correction factors exist for different engine speeds and installations.

7 Number 1 Balance Spinner Hole - radially offset hole in spinner identified by access slot being aft in relationship to the 37 slots on the spinner (Ref. Fig. 508).

NOTE : The offset hole appears to be larger in diameter with an arrow symbol on outer diameter forward side of hole or an "O" on flange on aft side of hole.

(2)Method 1 - fan trim balance procedure (analyzer)

NOTE : All reference to clock positions and direction of rotation are viewed in forward looking aft direction unless otherwise indicated.

(a)Connect trim balance analyzer to engine as follows (Ref. Fig. 503).

NOTE : Engine trim balance kit 2C14963G04 has FADEC capability with or without low pressure turbine balance capability. Engine trim balance kit 2C14963G06 does not have FADEC capability or low pressure turbine balance capability.

1 Open thrust reverser halves (Ref. 71-13-00, P. Block 301).

2 Remove plug from the N1 speed sensor connector on the fan case near the 2 o'clock position (aft looking forward).

3 Remove plug from the No. 1 bearing accelerometer connector near the 7 o'clock position on the core just aft of the fan case (aft looking forward).

4 Connect trim balance analyzer jumper cables to the No. 1 bearing accelerometer connector and the N1 speed sensor connector.

5 Route analyzer jumper cables down to and along forward side of 6 o'clock strut plumbing. Temporarily tape in place.

6 Route cables forward and down side of drain mast. Temporarily tape in place.

7 Add extra layer of tape around cables where thrust reverser and fan cowl panels make contact with 6 o'clock strut and drain mast seals.

8 Carefully close thrust reverser and fan cowl panels (Ref. 71-13-00, P. Block 301). Ensure that analyzer jumper cables do not get pinched when closing thrust reverser and fan cowls.

9 Connect analyzer to power source.

(b)Perform engine trim balance analyzer self-test.

1 Ensure the **ON/OFF** selector is in the **OFF** position.

2 Set the **ENGINE** selector to the **L/EXT** or **R/EXT** position.

3 Set the **MODE** selector to the **TEST** position.

4 Set the **INDICATE** selector to the **CHECK** position.

5 Connect the power source to the test set **POWER** source.

6 Set the **ON/OFF** selector to the **ON** position.

NOTE : The test set is now operating in the **CHECK** mode. **All LED's** illuminate for approximately 0.5 seconds then extinguish. The check loop sequence is repeated continuously while the **INDICATE** selector is in the **CHECK** position.

7 After one test cycle, move the **INDICATE** switch to **VEL** and allow the test set to warm up for 5 minutes.

8 Set the **INDICATE** selector to the **DISPL** position. The following indications should appear :

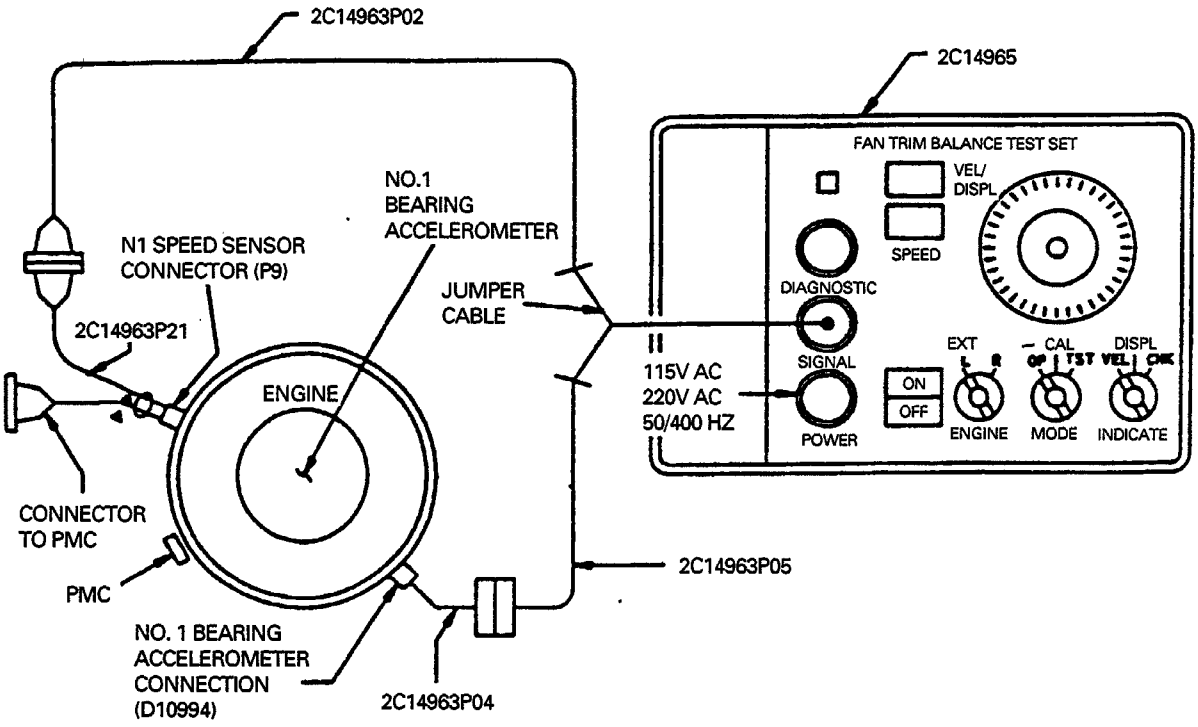
displ = 28 ± 1 mils

speed = 3430 ± 80 rpm

phase LED = adjacent to test reference

NOTE : If the indications are correct, the test set is fully checked out and functioning correctly.

CAUTION : **DO NOT EXCEED TAKEOFF POWER ASSURANCE SETTING. IT MAY BE NECESSARY TO ACCOMPLISH TRIM BALANCE AT A REDUCED RPM DURING COLD WEATHER OPERATION TO AVOID OVERBOOSTING ENGINE.**



LOOKING AFT

TRIM BALANCE ANALYZER - 2C14965
INDICATIONS

OPERATING MODES	SPEED	VEL/DISPL	PROTRACTOR
EQUIPMENT SELF-TEST	-	-	OBSERVE
EQUIPMENT TEST	3430	5.00	WITHIN BAND
CALIBRATION PHASE	DESIRED RPM	-	LED ON (ZERO SETTING)
OBTAIN PARAMETERS	DESIRED RPM	READ	READ

BM5 72 00 00 5 LCMO - 01

Trim Balance Analyzer - Hook Up Schematic
Figure 503

R (c)Obey the safety and operating precautions as described in Paragraph 3.
R (Ref. 71-00-00, P. Block 501).
R (d)Make sure that the wheel chocks CHOCK-MLG, ENGINE RUN-UP
R (98F10103500000) are in position in front of each forward MLG wheel.
R (e)There must be two qualified persons in the cockpit when performing an
R engine run above idle.One must monitor the outside and the aircraft
R behaviour while the other performs the engine test.
R (f)If the aircaft begins to move while performing an engine run,
R immediately set all the thrust levers to idle position.
R (g)Prepare and start engine as described for normal operation. Advance throttle and stabilize engine per the following :

1 If vibration amplitude reaches 10 mils, stabilize engine at the nearest of the following N1 settings (Ref. Fig. 504) :
91.5 % - 3000 rpm
94.5 % - 3100 rpm
97.6 % - 3200 rpm

NOTE : See (Ref. Fig. 504) to convert vibration units to mils.

2 If vibration amplitude is less than 10 mils, stabilize engine at 97.6 % (3200 rpm).

R (h)Set up analyzer as follows :

1 Set the MODE selector to CAL position.
2 Set the MODE selector to the OP position.

R (j)Record on log sheet, amplitude (mils), N1 fan speed setting (rpm), and blade number (location of imbalance) represented by the lit LED on the phase display.
R (k)Decelerate engine to idle and stabilize.
R (l)Shut down engine as described for normal operation.
R (m)Determine imbalance results of initial run.

1 From engine speed and amplitude of imbalance recorded on log sheet, determine weight magnitude (in grams) required to correct imbalance (Ref. Fig. 505).

R (n)Determine the location and weight correction required to balance the fan rotor.

1 Plot a map of existing balance weights (screw part numbers) in the spinner. The No. 1 hole in the spinner is the offset hole (Ref. Fig. 506, 508).
2 From log sheet, location of lit LED on the phase display represents the location of imbalance. To correct the imbalance, you must put the correction weight 180 degrees from the imbalance.
3 Determine replacement weights and effective weight difference (Ref. Fig. 507).
4 Typical example calculation of balance screw selection is as follows :
- From a typical run
Imbalance - 8.9 mils = 2.5 units
N1 Speed - 97.6 % (3200 rpm)
Imbalance Location - LED # 10
- From matrix (Ref. Fig. 505)
Weight magnitude (W1) - 66.75 grams
- From weight map (Ref. Fig. 506)
Locations 28, 29, 30, and 31 have P07 screws installed.
Spinner hole numbers 28, 29, 30, and 31 are 180 degrees opposite

from fan blade # 10.

- From balance weight magnitudes (Ref. Fig. 505) select balance screws such that difference between weight of replacement screws and screws to be removed equal W1.

Hole	Removed	Installed	Effective Difference
28	P07	P05 (21.15 - 6.44)	14.71
29	P07	P06 (23.75 - 6.44)	17.31
30	P07	P06 (23.75 - 6.44)	17.31
31	P07	P06 (23.75 - 6.44)	17.31
		TOTAL	66.64

- If more than one screw is required, install heavier screws at balance point and lighter screw(s) on either side of imbalance point.

NOTE : Since all 38 balance holes must be occupied, there will be a screw installed 180 degrees opposite location for new screw. Check weight of opposing screw ; if greater than 6.44 grams (P07) replace with lightest possible screw (P07). Subtract weight of this replacement screw (6.44, P07) from weight of removed screw. Then reduce required effective weight by this amount. This step is required to prevent compound build-up of excessive balance weight in the spinner. It is even possible (in extreme cases) to achieve rotor balance by simply removing opposing weight.

5 Remove existing balance screws and install replacement balance screws. TORQUE screws to between 50 and 70 lbf.in. (0.56 and 0.79 m.daN).

6 Prepare engine and rerun as described for normal operation.

7 If indicated imbalance is within limits, trim balance is complete. If imbalance exceeds desired limits, stabilize engine at same N1 rpm used during original run and record vibration amplitude (U1), N1 (rpm), and blade number (location of imbalance) represented by the lit LED on the phase display.

8 Determine second correction weight (W2) and angle correction required to balance fan by plotting.

- On polar graph paper, plot original imbalance (Uo) at original phase angle (Ao) from original test run (Ref. Fig. 509).
- Plot imbalance (U1), at phase angle (A1), from data obtained on run with first balance weight (W1) installed.
- Connect vector tips, as shown, from Uo to U1. Label this line R1. Measure length of R1 in mils using same scale as used for Uo and U1.
- Measure included angle from R1 to Uo. Record angle and clock direction of arc moving from R1 to Uo.

NOTE : If protractor is not available, angle can be determined by extending vector Uo through center of polar plot. Transpose R1 using parallel rule to center of plot. Determine angle and direction (Ref. Fig. 510).

- Determine position of second correction weight by dividing correction angle found above by 9.5° (360° divided by 38

(number of screw positions) = 9.5° between each pair of screws).
- Calculate new screw position by counting screw positions determined in previous step in clock direction recorded before the NOTE above.
- Calculate second correction weight (W2) using the formula :

$$W2 = W1 \times (Uo/R1)$$

From the table of balance screw weights (Ref. Fig. 507) select the combination of screws which most closely approximates the desired weight (W2).

9 Installation of balance screws (W2)
- Remove the balance screws (W1) and reinstall the original screws removed in step C.(2)(i)5.
TORQUE screws to between 50 and 70 lbf.in. (0.56 and 0.79 m.daN).
- Remove screws at new location and install balance screws (W2).
TORQUE screws to between 50 and 70 lbf.in. (0.56 and 0.79 m.daN).

10 Determine results of balancing.
- Start and operate engine as in original run.
- If vibration is within desired limits, trim balance is complete.
- If vibration amplitude is beyond desired limits, stabilize engine at same N1 (rpm) used during original run and record vibration amplitude (U3), N1 (rpm), and blade number (location of imbalance) represented by the lit LED on the phase display.

11 Repeat plotting and run procedures until vibration is acceptable.
NOTE : Always use original run data (Uo and Ao) to plot with subsequent run data (U3 and A3 ; U4 and A4 ; etc.).

R (p)Remove trim balance analyzer wiring from engine.
1 Open thrust reverser halves (Ref. 71-13-00, P. Block 301).
2 Disconnect trim balance analyzer jumper cables from accelerometer and N1 speed sensor connector and remove wiring from engine.
3 Connect plug to the N1 speed sensor connector.
4 Connect plug to the No. 1 bearing accelerometer connector.
5 Close thrust reverser halves (Ref. 71-13-00, P. Block 301).

(3)Method 2. Alternate Trim Balance Procedure (Three-Shot Plot)
(Ref. Fig. 511)
Method 2 Trim Balance Procedure uses the aircraft vibration monitoring system to obtain read out of the vibration amplitude, and consists of making three engine runs with a known trial weight at three equally spaced locations, plotting the data on polar graph paper, locating weight imbalance, and correcting the weight amount for fan trim balance.

(a)Record the type and location of all balance screws installed in engine.

(b)Identify in a clockwise direction three locations of P07 weights, 123° (13 holes) apart where P06 weights may be installed without interfering with other weights. Record selections as 1, 2 and 3.
Example : (Selection 1 - 38, 1, 2)
(Selection 2 - 25, 26, 27)
(Selection 3 - 12, 13, 14)
NOTE : If three locations are impossible to identify remove all other weights and install P07 screws or if weights are scattered, install all P07 screws.

N1 PCT	AIRCRAFT INDICATOR UNITS 1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
20.	17.5	34.9	52.4	69.9	87.3	104.8	122.3	139.7	157.2	174.7
25.	14.0	27.9	41.9	55.9	69.9	83.8	97.8	111.8	125.8	139.7
30.	11.6	23.3	34.9	46.6	58.2	69.9	81.5	93.2	104.8	116.5
35.	10.0	20.0	29.9	39.9	49.9	59.9	69.9	79.9	89.8	99.8
40.	8.7	17.5	26.2	34.9	43.7	52.4	61.1	69.9	78.6	87.3
50.	7.0	14.0	21.0	27.9	34.9	41.9	48.9	55.9	62.9	69.9
60.	5.8	11.6	17.5	23.3	29.1	34.9	40.8	46.6	52.4	58.2
70.	5.0	10.0	15.0	20.0	25.0	29.9	34.9	39.9	44.9	49.9
80.	4.4	8.7	13.1	17.5	21.8	26.2	30.6	34.9	39.3	43.7
90.	3.9	7.8	11.6	15.5	19.4	23.3	27.2	31.1	34.9	38.8
95.	3.7	7.4	11.0	14.7	18.4	22.1	25.7	29.4	33.1	36.8
100.	3.5	7.0	10.5	14.0	17.5	21.0	24.5	27.9	31.4	34.9
105.	3.3	6.7	10.0	13.3	16.6	20.0	23.3	26.6	29.9	33.3
110.	3.2	6.4	9.5	12.7	15.9	19.1	22.2	25.4	28.6	31.8
115.	3.0	6.1	9.1	12.2	15.2	18.2	21.3	24.3	27.3	30.4

FAN (N1) VIBRATION MILS DISPLACEMENT (D.A.)

N1 PCT	AIRCRAFT INDICATOR UNITS 1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
60.	1.9	3.9	5.8	7.8	9.7	11.7	13.6	15.5	17.5	19.4
64.	1.8	3.6	5.5	7.3	9.1	10.9	12.8	14.6	16.4	18.2
68.	1.7	3.4	5.1	6.9	8.6	10.3	12.0	13.7	15.4	17.1
72.	1.6	3.2	4.9	6.5	8.1	9.7	11.3	13.0	14.6	16.2
76.	1.5	3.1	4.6	6.1	7.7	9.2	10.7	12.3	13.8	15.3
80.	1.5	2.9	4.4	5.8	7.3	8.7	10.2	11.7	13.1	14.6
84.	1.4	2.8	4.2	5.6	6.9	8.3	9.7	11.1	12.5	13.9
88.	1.3	2.7	4.0	5.3	6.6	8.0	9.3	10.6	11.9	13.3
92.	1.3	2.5	3.8	5.1	6.3	7.6	8.9	10.1	11.4	12.7
96.	1.2	2.4	3.6	4.9	6.1	7.3	8.5	9.7	10.9	12.1
100.	1.2	2.3	3.5	4.7	5.8	7.0	8.2	9.3	10.5	11.7
104.	1.1	2.2	3.4	4.5	5.6	6.7	7.8	9.0	10.1	11.2
108.	1.1	2.2	3.2	4.3	5.4	6.5	7.6	8.6	9.7	10.8
110.	1.1	2.1	3.2	4.2	5.3	6.4	7.4	8.5	9.5	10.6

CORE (N2) VIBRATION MILS DISPLACEMENT (D.A.)

CONVERSION EQUATIONS: 1 INDICATOR UNIT = 0.6 IN./SEC. VELOCITY

$$\text{N1 MILS DISP (D.A.)} = \frac{\text{UNITS} \times 349.4}{\text{N1\%}} \qquad \text{N2 MILS DISP (D.A.)} = \frac{\text{UNITS} \times 116.6}{\text{N2\%}}$$

1108640-00-A

BM5 72 00 00 5 LEMU - 00

Vibration Unit Conversion Table (Aircraft Units to Mils Displacement)
Figure 504

HOLE LOCATION

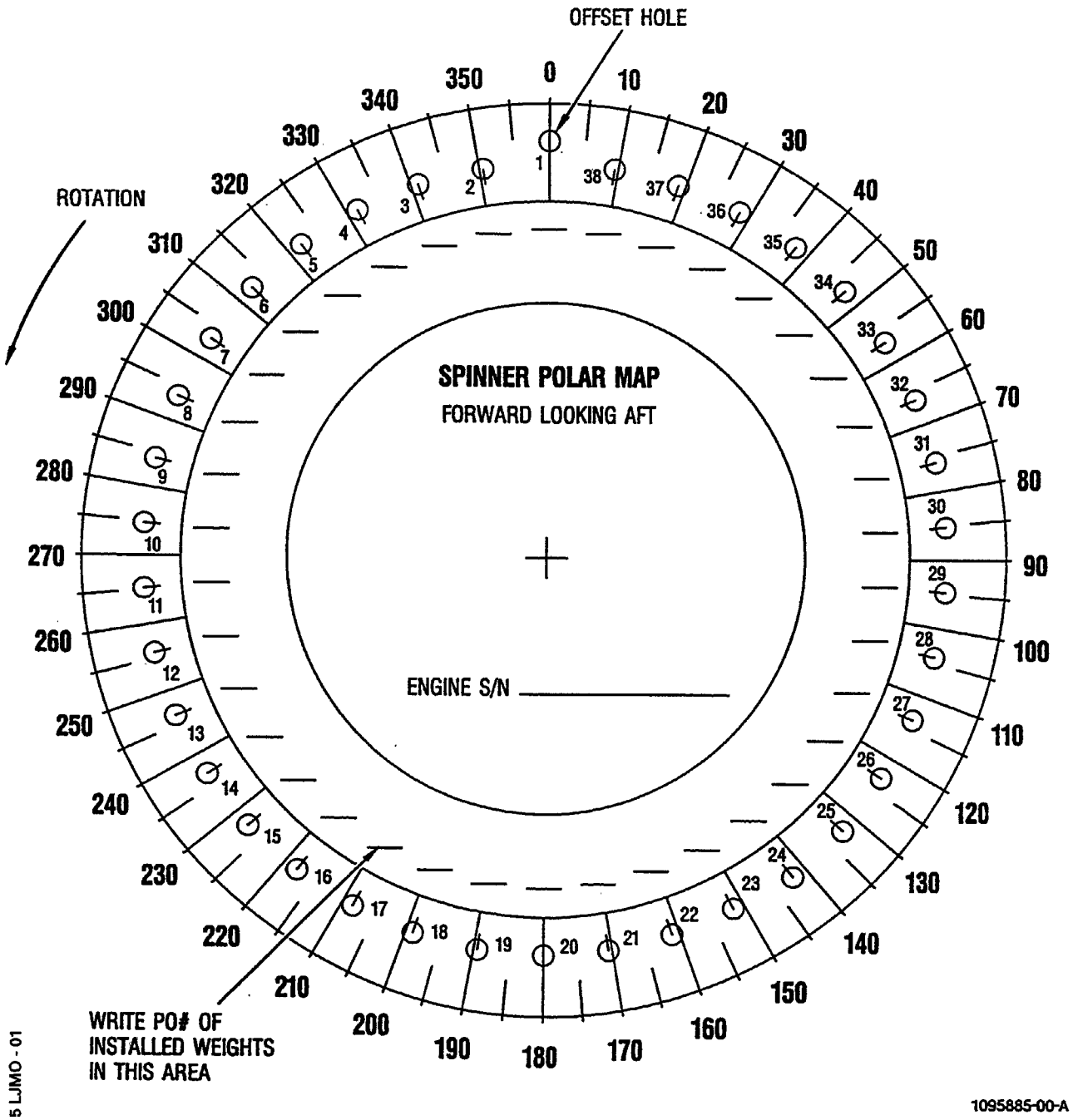
NOTE : ALL SPINNER HOLES ARE COUNTED, BEGINNING WITH THE OFFSET HOLE AS NO. 1, COUNTING COUNTER CLOCKWISE, FORWARD LOOKING AFT.

ANALYSER LED DISPLAY		CORRECTION WEIGHT HOLE NUMBER	ANALYSER LED DISPLAY		CORRECTION WEIGHT HOLE NUMBER
NUMBER	ANGLE		NUMBER	ANGLE	
01	0°	21	20	180°	2
02	351°	22	21	171°	3
03	342°	23	22	161°	4
04	332°	24	23	152°	5
05	323°	25	24	142°	6
06	313°	26	25	133°	7
07	304°	27	26	123°	8
08	294°	28	27	114°	9
09	285°	29	28	104°	10
10	275°	30	29	95°	11
11	266°	31	30	85°	12
12	256°	32	31	76°	13
13	247°	33	32	66°	14
14	237°	34	33	57°	15
15	228°	35	34	47°	16
16	218°	36	35	38°	17
17	209°	37	36	28°	18
18	199°	38	37	19°	19
19	190°	1	38	9°	20

WEIGHT MAGNITUDE			
AMPLITUDE, MILS	3200 RPM (97,6%)	3100 RPM (94,5%)	3000 RPM (91,5%)
01	07.5 GRAMS	08.1 GRAMS	08.7 GRAMS
02	15.0 GRAMS	16.2 GRAMS	17.4 GRAMS
03	22.5 GRAMS	24.3 GRAMS	26.1 GRAMS
04	30.0 GRAMS	32.4 GRAMS	34.8 GRAMS
05	37.5 GRAMS	40.5 GRAMS	43.5 GRAMS
06	43.0 GRAMS	48.6 GRAMS	52.2 GRAMS
07	52.5 GRAMS	56.7 GRAMS	60.9 GRAMS
08	60.0 GRAMS	64.8 GRAMS	69.6 GRAMS
09	67.5 GRAMS	72.9 GRAMS	78.3 GRAMS
10	75.0 GRAMS	81.0 GRAMS	87.0 GRAMS

BM5 72 00 00 5 LGMO - 02

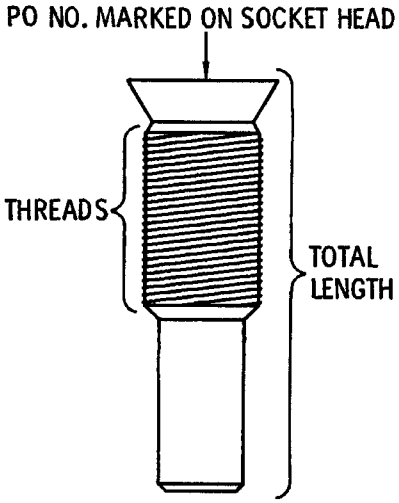
Fan Trim Balance Matrix
Figure 505



BM5 72 00 00 5 LJMO - 01

Polar Map and Installed Weights
Figure 506

SPINNER CONE BALANCE WEIGHTS



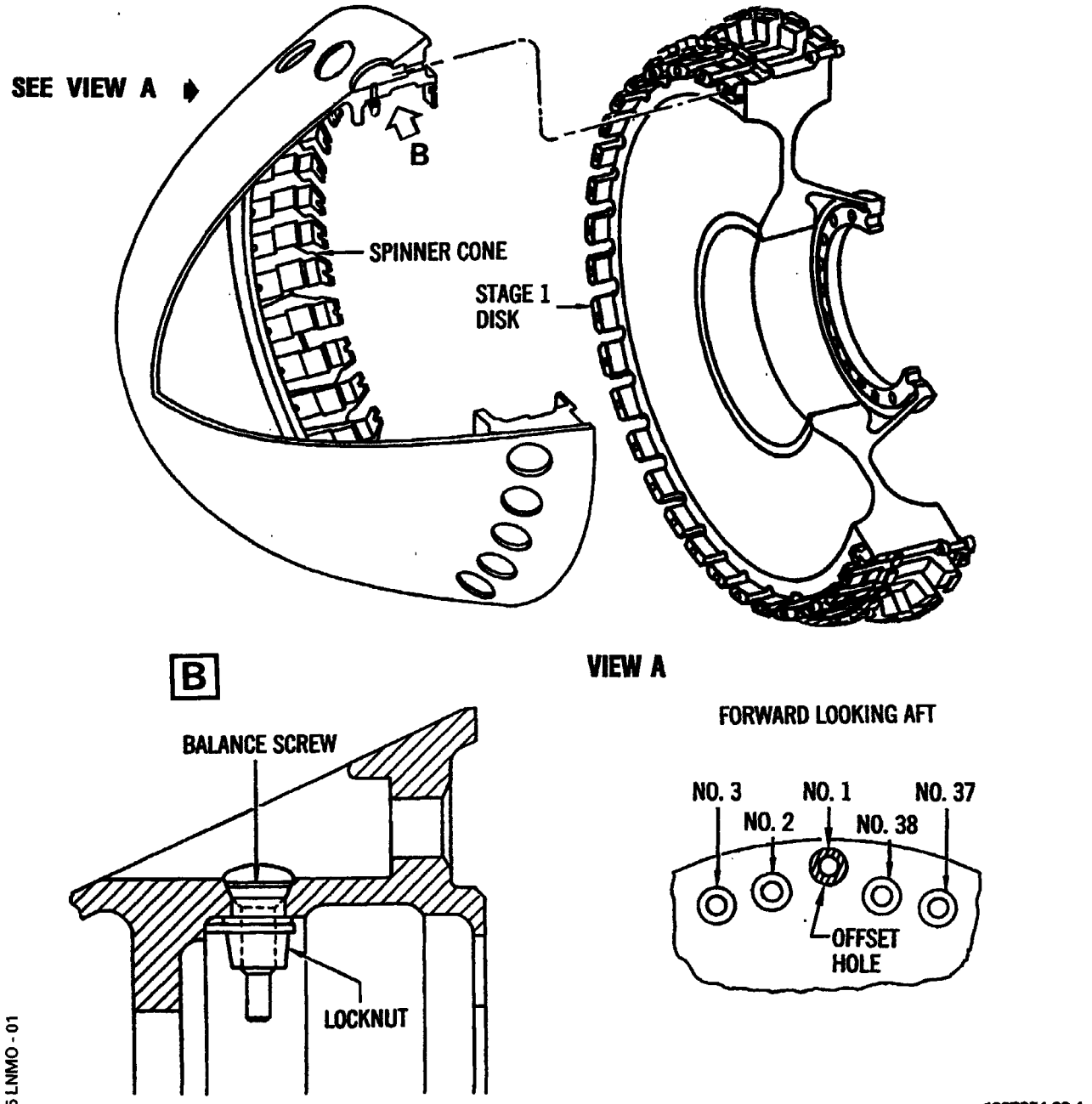
SCREW PART NO.	INCHES	MM	PAN WEIGHT (GRAMS)	EFF. WT.
9111M35P07	0.8	20.3	6.6	6.44
9111M35P01	1.3	33.0	10.0	9.58
9111M35P02	1.8	45.7	13.4	12.68
9111M35P03	2.3	58.4	16.8	15.60
9111M35P04	2.8	71.1	20.0	18.44
9111M35P05	3.3	83.8	23.6	21.15
9111M35P06	3.8	96.5	27.0	23.75

EFFECTIVE WEIGHT DIFFERENCE

PO NO.	P07	P06	P05	P04	P03	P02	P01
P07	0	17.31	14.71	12.00	9.16	6.24	3.14
P01	3.14	14.17	11.57	8.86	6.02	3.10	0
P02	6.24	11.07	8.47	5.76	2.92	0	3.10
P03	9.16	8.15	5.55	2.84	0	2.92	6.02
P04	12.00	5.31	2.71	0	2.84	5.76	8.86
P05	14.71	2.60	0	2.71	5.55	8.47	11.57
P06	17.31	0	2.60	5.31	8.15	11.07	14.17

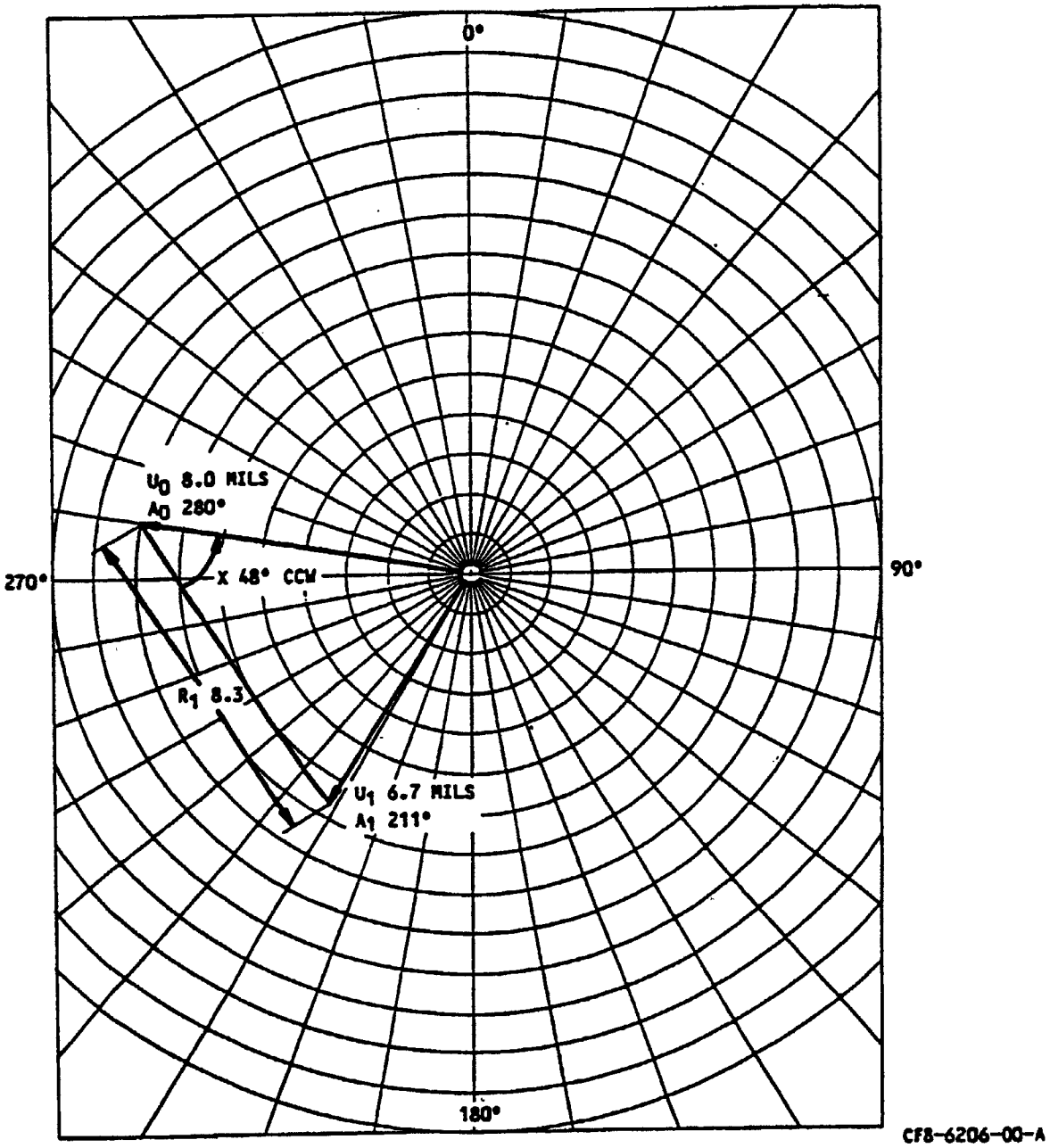
BM5 72 00 00 5 LLMO - 01

Spinner Cone Balance Weights
Figure 507



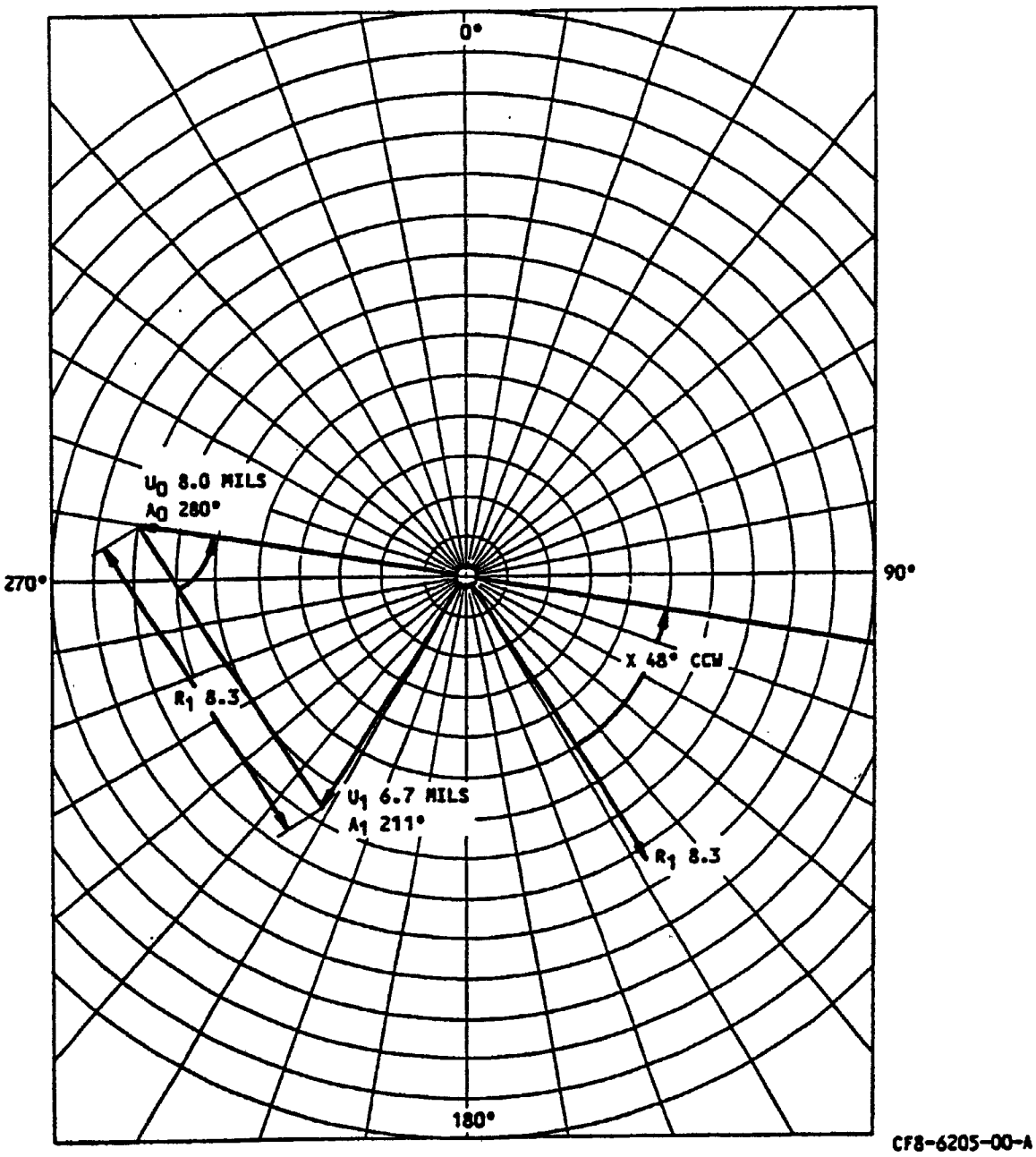
BM5 72 00 00 5 LNMO - 01

Balance Weight and Spinner Cone Installation
Figure 508



BMS 72 00 00 5 LPMO - 01

Computing Matrix Corrections
Figure 509



BM5 72 00 00 5 LRMO - 01

Computing Angle X by Transposition
Figure 510

CAUTION : DO NOT EXCEED TAKEOFF POWER SETTING. TAKE SPECIAL CARE DURING COLD WEATHER OPERATION. IT MAY BE NECESSARY TO ACCOMPLISH TRIM BALANCE AT A REDUCED RPM TO AVOID OVERBOOSTING THE ENGINE.

(c)Determine fan speed N1 required for engine run tests by accelerating engine while observing operational limits and checking vibration amplitude levels.
Select fan speed (N1) for engine run tests as follows :
NOTE : The N1 speed determined must be used throughout the engine run tests to obtain valid results.

1 If vibration amplitude reaches 10 mils, for nearest N1 setting, stabilize engine for 15 seconds at either 94.5 percent (3100 rpm) or 97.6 percent (3200 rpm).
2 If vibration amplitude is less than 10 mils, stabilize engine at 97.6 percent (3200 rpm). Record N1 rpm and amplitude (Uo) on log sheet.
NOTE : The N1 speed determined must be used throughout the run tests to obtain valid results.

(d)Engine Run No. 1

1 From selection No. 1, install three P06 weights (WT) at recorded locations.
Example (38, 1, 2)
NOTE : If locations have been arbitrarily numbered, select No. 1 location where the first trial weight was centered.
2 Run engine at previously determined N1 setting above. Record imbalance (U1).
Replace the three P06 screws (WT) with original screws.

(e)Engine Run No. 2

1 From selection No. 2, install three P06 weights (WT) at recorded locations.
Example : 25, 26, 27 (CW, 123° or 13 holes from first selection)
2 Run engine at previously determined N1 setting. Record imbalance (U2).
3 Replace the three P06 screws (WT) with original screws.

(f)Engine Run No. 3

1 From selection No. 3 install three P06 weights (WT) at recorded locations.
Example : 12, 13, 14 (CW, 246° or 26 holes from first selection)
2 Run engine at previously determined N1 setting.
Record imbalance (U3).
3 Replace the three P06 screws (WT) with original screws.

(g)Plot data on polar graph paper as follows :
(Ref. Fig. 511)
NOTE : Data must be from same N1 setting.

1 Draw a circle whose radius represents initial imbalance Uo.
2 Draw an arc whose radius represents U1. Locate center of arc on circumference of circle at 0 degrees location.
3 Draw an arc whose radius represents U2. Locate center of arc on circle at 123 degrees location.
4 Draw an arc whose radius represents U3. Locate center of arc on circle at 246 degrees location.
5 Connect the center of the circle with the intersection of the 3 arcs. Label this line R.

NOTE : If the arcs do not intersect, use center of area within the 3 arcs. If the center of the area cannot be determined, increase trial weight value by 50 percent and repeat procedure.

6 Measure length of R1 and record.

(h) Measure the angle from by 0° radial line and line R1. Record size of angle and its clock direction from 0°.

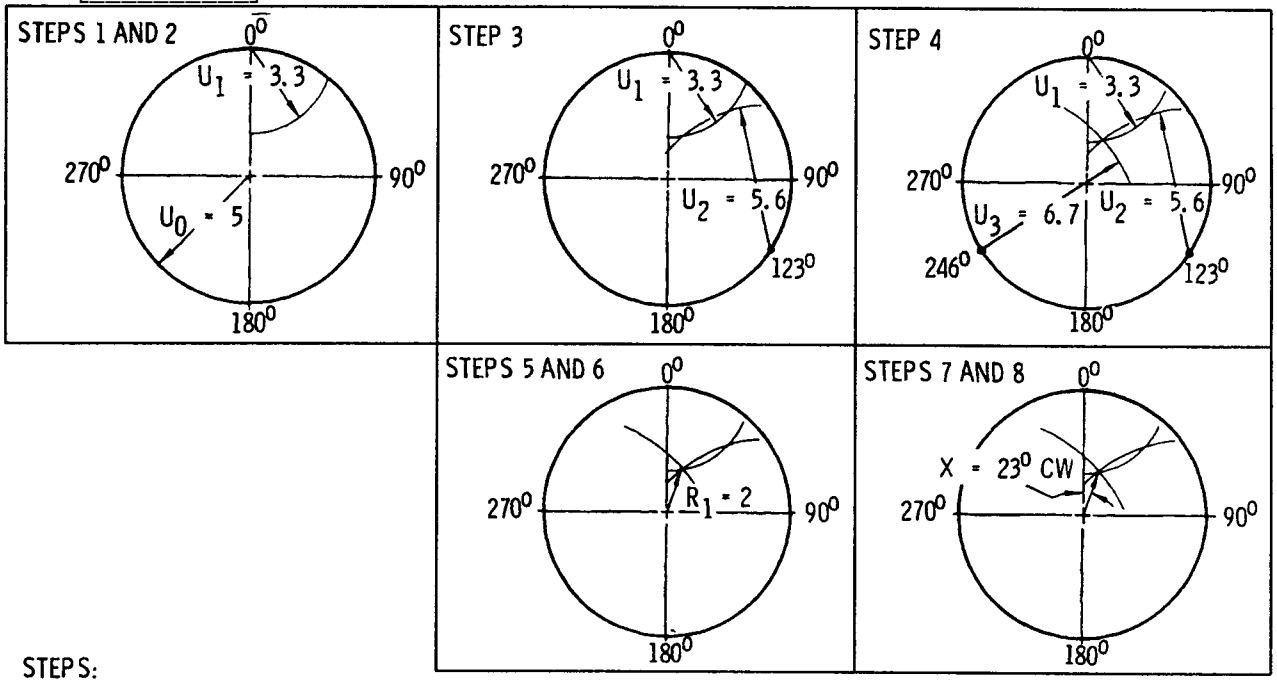
R (j) Calculate weight (WF) required to balance engine where WF = WT x (Uo/R1)
Example : WF = 51.9 x (5/2) = 130 grams

R (k) Determine equivalent weight selection (Ref. Fig. 507) and install at angle as determined.

5. Abnormal Operations (Ref. 71-00-00, P. Block 501)

6. Engine Adjustments (Ref. 71-00-00, P. Block 501)

7. Temperature Conversion (Ref. Fig. 512)
Refer to figure for conversion of temperatures from celsius to Fahrenheit or vice versa.



STEPS:

1. DRAW A CIRCLE WHOSE RADIUS REPRESENTS THE INTIAL IMBALANCE U_0 (-5 MILS) BEFORE ADDITION OF ANY WEIGHTS.
2. DRAW AN ARC WHOSE RADIUS REPRESENTS IMBALANCE U_1 (3.3 MILS) WITH W_t INSTALLED. LOCATE THE CENTER OF THE ARC ON THE CIRCUMFERENCE OF THE CIRCLE AT THE 0° LOCATION.
3. DRAW AN ARC WHOSE RADIUS REPRESENTS IMBALANCE U_2 (5.6 MILS) WITH W_t INSTALLED. LOCATE THE CENTER OF THE ARC ON THE CIRCUMFERENCE OF THE CIRCLE AT THE 123° (13 SCREW HOLES CW) LOCATION.
4. DRAW AN ARC WHOSE RADIUS REPRESENTS IMBALANCE U_3 (6.7 MILS) WITH W_t INSTALLED. LOCATE THE CENTER OF THE ARC ON THE CIRCUMFERENCE OF THE CIRCLE AT THE 246° LOCATION (13 SCREW HOLES CW FROM POSITION 2).
5. DRAW A LINE (R_1) FROM THE CENTER OF THE CIRCLE TO THE INTERSECTION OF THE THREE ARCS.

NOTE:
IF THE THREE ARCS DO NOT INTERSECT USE A POINT APPROXIMATELY IN THE CENTER OF THE AREA WITHIN THE ARCS.

6. MEASURE LENGTH OF R_1 AND RECORD.
7. MEASURE THE ANGLE (X) FORMED BY 0° RADIAL AND LINE R_1; RECORD SIZE OF ANGLE AND ITS CLOCK DIRECTION FROM 0°.
8. CALCULATE W_F WHERE:

$$W_F = W_t\left(\frac{U_0}{R_1}\right)$$

$$W_F = 51.9\left(\frac{5}{2}\right)$$

$$W_F = 130 \text{ GRAMS}$$

9. CALCULATE WEIGHT LOCATION 23° ÷ 9.5° = 2.4 HOLES CW FROM NO.1 HOLE.

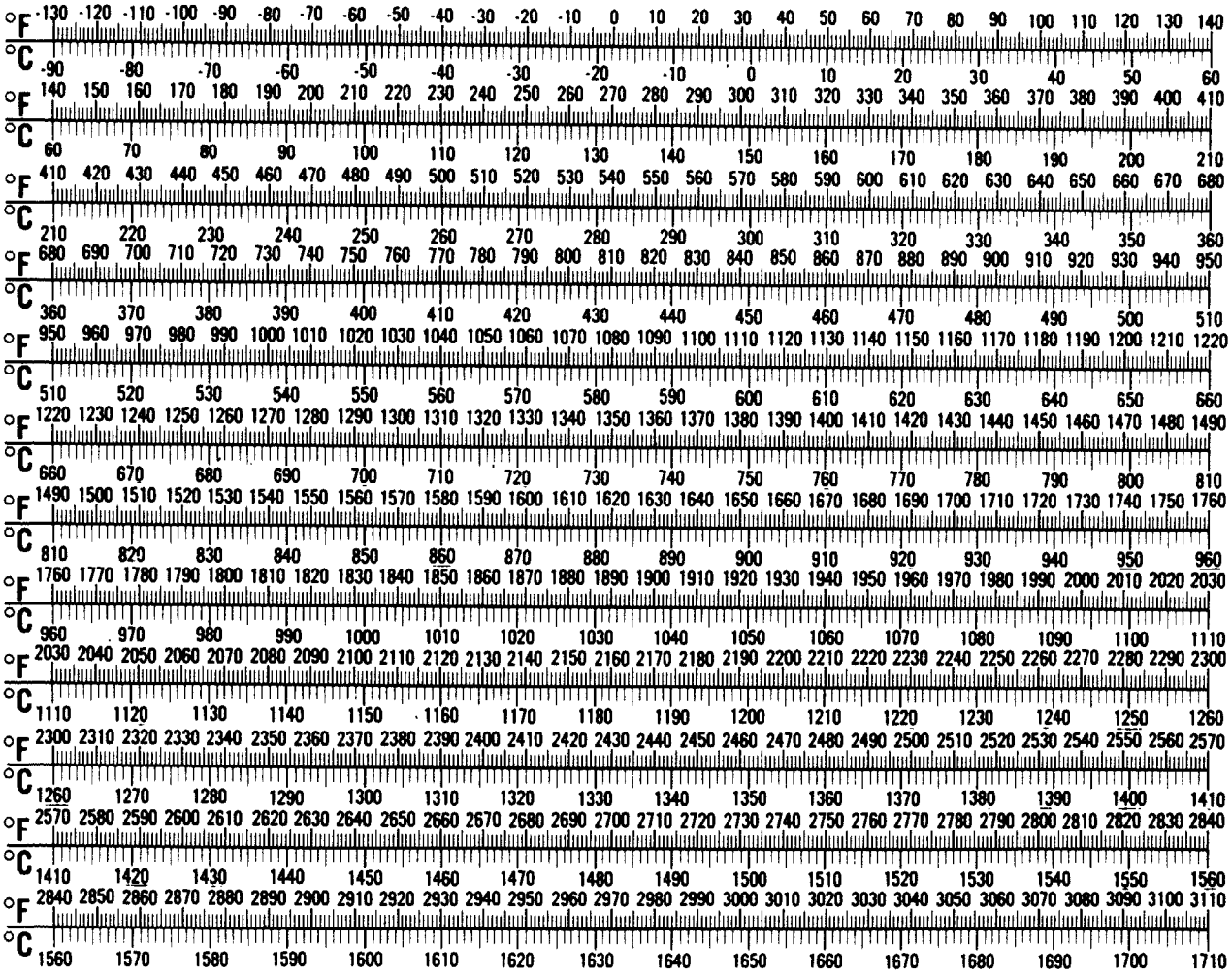
1027255-01-A

BM5 72 00 00 5 LTMO - 01

Three Shot Plot - Example
Figure 511

TEMPERATURE CONVERSION CHART

$^{0}F = 9/5\ ^{0}C + 32 = 1.8\ (^{0}C + 17.8)$ $^{0}C = 5/9\ (^{0}F - 32)$ FOR INTERPOLATION $1^{0}C = 1.8^{0}F$



CF8-3906-00-A

BM5 72 00 00 5 LVMO - 15 - 10
DM5

Temperature Conversion Chart
Figure 512

1. General

Inspection/Checks of the engine assembly are divided into five categories : Periodic, Foreign Object Damage (FOD) (this includes ice or hailstones), Fire, Operational overlimits and Special. Periodic Inspection/Checks must be performed at scheduled intervals as defined by the specific airline maintenance plan based on existing General Electric recommendations and approved by the appropriate regulatory agency.

The inspection requirements and limits throughout this manual are based on operation within specified limits. In addition to the regular inspections, there are those necessary when the engine has been operated outside of the specified limits, (for example, overspeed or overtemperature). There are also special inspections necessary for engines to which unusual conditions are applied. These include aircraft accidents and incidents specified in ICAO Annex 13. Also included are other unusual incidents such as a hangar or ramp fire, or an accident during engine transport, handling or storage.

This section gives the inspection checks necessary after an overlimit operation and the special inspection checks necessary for engines exposed to unusual conditions.

2. Equipment and Materials

	ITEM	DESIGNATION
	A. Material No.C02-033	Anti-seize Compounds, Lubricants, Oils (Ref. 70-00-00)
	B. Material No.C02-058	Anti-seize Compounds, Lubricants, Oils (Ref. 70-00-00)
	C. Material No.C02-071	Anti-seize Compounds, Lubricants, Oils (Ref. 70-00-00)
	D. Material No.C04-001	Cleaning Compounds and Solvents (Ref. 70-00-00)
	E. 2C6962	Gage-Sight, VSV Lever Arms (Connectors Installed)
	or 2C6966	Gage-VSV, Lever Arm Installed
	or 2C8016	Gage-Sight, VSV Stage 5
	F.	Preformed Packing
R	G.	Borescope, Flexible
R		0.2 inch (5.1 mm) tip diameter
R	H. PF53361-2PWS	Dispenser, Oil
R	(Or equivalent)	2 Gallon, Model 250 with pressure gauge
R		Malabar International
R		220 West Los Angeles Avenue
R		Simi Valley, CA 93065
R	I.	Regulator, Oil Pressure (Optional)
R	J.	Hose, Flexible with Adaptor
R	K. 2C6948P05	Tube, Guide (Optional)

	ITEM	DESIGNATION
	Referenced Procedures	
	- 12-13-79, P. Block 1	Engine Lubricating Oil
	- 29-00-00, P. Block 301	Hydraulic Power - General
	- 71-00-00, P. Block 401	Power Plant-General
	- 71-00-00, P. Block 501	Power-Plant-General
	- 71-70-00, P. Block 201	Drains
	- 72-00-00, P. Block 201	Engine-General
	- 72-00-00, P. Block 501	Engine-General
	- 72-00-00, P. Block 701	Engine-General
	- 72-09-03, P. Block 601	Hoses and Tube Assemblies
	- 72-21-00, P. Block 601	Fan Rotor Assembly
	- 72-21-01, P. Block 401	No. 1 Bearing Manifold
	- 72-22-00, P. Block 601	Forward Fan Case Assembly
	- 72-23-00, P. Block 601	Fan Frame and Case Assembly
	- 72-31-00, P. Block 601	Compressor Rotor
	- 72-31-00, P. Block 801	Compressor Rotor
	- 72-32-00, P. Block 601	Compressor Variable Stator Assembly
R	- 72-41-00, P. Block 601	Combustion Chamber Assembly
	- 72-51-00, P. Block 601	Stage 1 High Pressure Turbine Nozzle Assembly
R	- 72-52-00, P. Block 601	Second Stage HP Turbine Nozzle Assembly
R	- 72-53-00, P. Block 601	High Pressure Turbine Rotor Assembly
R	- 72-55-00, P. Block 601	First Stage LP Turbine Nozzle Assembly
R	- 72-56-00, P. Block 601	Low Pressure Turbine Stator Assembly
R	- 72-57-00, P. Block 601	Low Pressure Turbine Rotor Assembly
	- 73-21-01, P. Block 601	Main Engine Control
	- 73-21-02, P. Block 601	Compressor Inlet Temperature Sensor
	- 77-11-01, P. Block 401	N1 Speed Sensor
	- 77-21-04, P. Block 401	Thermocouple Probes
	- 78-11-02, P. Block 401	Engine Exhaust Plug
	- 79-00-00, P. Block 301	Oil-Servicing
	- 79-22-03, P. Block 401	Magnetic Plug

3. Periodic Inspection/Checks

A. Closed Cowling Checks
Visually inspect the following areas using a powerful light source :
(1)Fan inlet area
NOTE : FOD includes ice or hailstone ingestion.
(a)FOD of fan blades, spinner and acoustical panels.
(b)Tip area of fan blades for cracks or distortion.
(c)FOD of booster blades.
(2)Fan exit area
(a)FOD of outlet guide vanes.
(b)Ram air scoop for blockage or damage.
(3)Engine exhaust area
(a)Condition of LPT aft stage blades.
(b)Metal debris inside exhaust nozzle.
(4)All other areas

(a)Buckling, distortion and damage.
(b)Evidence of fuel, oil or air leakage.
(c)Evidence of hot spots.
(d)Master magnetic chip detector for metallic debris.

B. Open Cowling Checks
Visually inspect the following areas using a powerful light source:
(1)Fan area - damage
(a)Forward engine mount
(b)Fan frame and casing
(c)Gearboxes
(d)Accessories
(e)Reverser pneumatic drive motor
(f)Piping, hoses and brackets
(g)VSV actuation system
(h)Engine to airplane linkage.
(2)Core engine area
(a)Aft engine mount - damage
(b)Fire seals - damage
(c)Cowl inner area - cracks, hot spots and distortion
(d)Engine frames and casing - cracks, hot spots, distortion and damage
(3)All areas
(a)Plumbing, clamps, brackets, linkage and electrical leads - condition
(b)Evidence of fuel, oil or air leakage
(4)Lube system - Ref. 79-00-00
(5)Fuel system - Ref. 73-00-00
(6)Starter system - Ref. 80-00-00
(7)Ignition system - Ref. 74-00-00

C. Internal Checks
Inspect the following areas using borescope and/or radiographic methods :
R (1)Combustion chamber assembly (Ref. 72-41-00, P. Block 601).
R (2)First stage high pressure turbine nozzle assembly (Ref. 72-51-00,
R P. Block 601).
R (3)Second stage high pressure turbine nozzle assembly (Ref. 72-52-00,
R P. Block 601).
R (4)High pressure turbine rotor assembly (Ref. 72-53-00, P. Block 601).
R (5)First stage low pressure turbine nozzle assembly (Ref. 72-55-00,
R P. Block 601).
R (6)Low pressure turbine stator assembly (Ref. 72-56-00, P. Block 601).
R (7)Low pressure turbine rotor assembly (Ref. 72-57-00, P. Block 601).

4. Foreign Object Damage (FOD) - Inspection
WARNING : THERE IS A POSSIBLE HEALTH RISK TO PERSONNEL WHO DO MAINTENANCE TASKS AFTER A BIRD STRIKE. THE SAFETY MEASURES THAT FOLLOW ARE RECOMMENDED.
- USE DISPOSABLE GLOVES.
- USE A DISPOSABLE COVERALL IF THERE IS A RISK OF BODY CONTACT WITH THE BIRD REMAINS.
- DO NOT USE PRESSURIZED AIR OR WATER TO CLEAN THE PARTS WHICH WERE IN CONTACT WITH THE BIRD.

- REMOVE THE BIRD REMAINS AND PUT THEM IN A PLASTIC BAG.
- DO NOT TOUCH YOUR FACE, EYES, NOSE, ETC. WITH YOUR GLOVES.
- REMOVE THE GLOVES AND THE DISPOSABLE COVERALL AND PUT THEM IN THE SAME PLASTIC BAG AS THE REMAINS. SEAL THE BAG.
- DISCARD THE BAG AS YOU DO FOR USUAL GARBAGE.
- CAREFULLY WASH YOUR HANDS WITH SOAP AND WATER.

A. General

(1) If there is an indication that the foreign object has gone into the engine bypass stream (not through the engine core), do a fan area visual inspection (paragraph B. below).

(2) When you think that foreign objects have gone into the engine core, you must do a fan area visual inspection (paragraph B. below) and a core engine area visual and borescope inspection (paragraph C. below).

B. Fan Area Visual Inspection. Inspect the following :

(1) Do a visual inspection of the fan blades and spinner (Ref. 72-21-00, P. Block 601).

(2) Do a visual inspection of the fan forward case (Ref. 72-22-00, P. Block 601).

C. Core Engine Area Visual and Borescope Inspection

(1) Do a borescope inspection of the high pressure compressor rotor stages 1 and 12 for damage (Ref. 72-31-00, P. Block 601).

(2) If damage is found, do a borescope inspection of all the high pressure compressor rotor stages.

5. Engine Fire or Fire Extinguishing Agents - Checks

A. If the crew closed the fire shut-off valve during operation of the fire extinguishers with engine running, do the check of the hydraulic system after operation of the engine pumps in possible starvation or cavitation condition (Ref. 29-00-00, P. Block 301).

B. Fire Damage

All engines damaged by fire require special inspection which exceeds the normal inspection requirements. For special inspection instruction for relative engine parts, contact GENERAL ELECTRIC representative.

C. External Exposure to Fire Extinguishing Agents

If the engine has been exposed to fire extinguishing agents (without a fire) on its external surfaces, decontaminate as follows :

(1) Carbon dioxide (CO_2) contamination

(a) Cold sections : Parts not exposed to heat require no maintenance action

(b) Hot sections : Parts exposed to heat at time of contamination must be removed for inspection. Refer to applicable sections in Maintenance and Engine Manuals.

(2) Chemical form contamination

(a) Rinse exposed areas using clean running water.

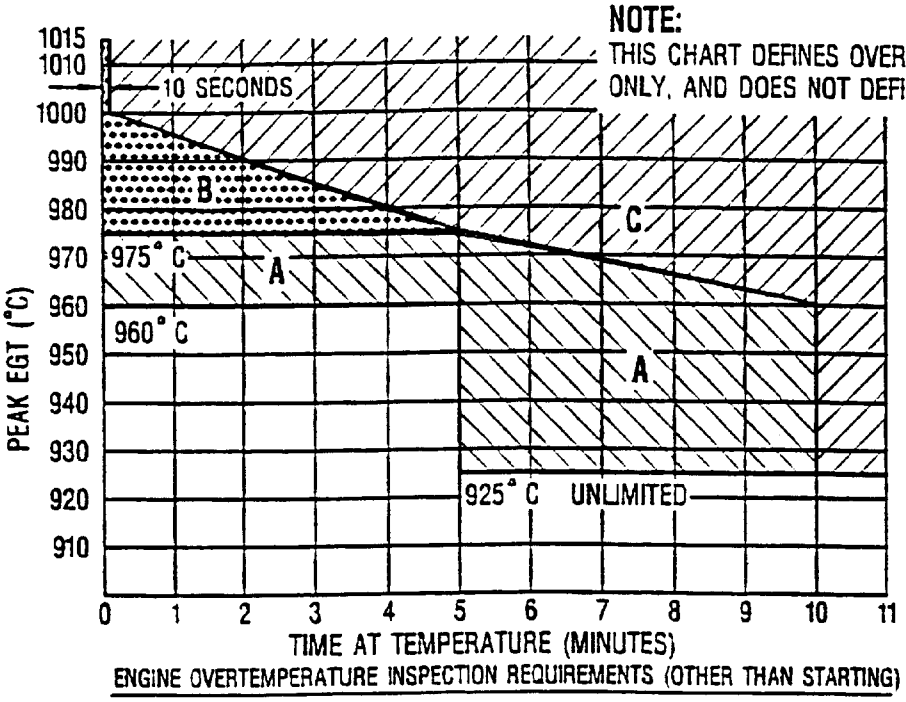
(b) Scrub to remove all foam agents

(3)Dry chemical powder contamination. Clean (Ref. 72-00-00, P. Block 701).
(4)Halogenated hydrocarbon contamination.
(a)Rince exposed areas using clean running water.

D. Internal Exposure to Fire Extinguishing Agents.
If the engine has been exposed to fire extinguishing agents (without a fire) on internal surfaces, decontaminate as follows :
(1)Carbon dioxide (CO_2) contamination
(a)Remove contaminated parts.
(b)Inspect per applicable Maintenance or Engine Manuel sections.
(2)Chemical foam contamination
(a)Flush with clean water and motor engine (if practicable) to remove foam residues.
(b)Remove engine for disassembly and cleaning.
(c)Refer to applicable Maintenance and Engine Manual sections.
(3)Dry chemical powder contamination
(a)Clean (Ref. 72-00-00, P. Block 701).
(b)Remove engine for disassembly and cleaning.
(c)Refer to applicable Maintenance and Engine Manual sections.
(4)Halogenated hydrocarbon contamination.
(a)Remove engine for inspection after disassembly and cleaning.
(b)Refer to Applicable Maintenance and Engine Manual Sections.

6. Overshoot of Engine Operational Limits - Checks

A. Overtemperature Inspection
NOTE : Engine which exceed EGT limits during operation must have maintenance actions performed.
(1)High EGT during starting
When the starting EGT limit is exceeded, record peak temperature and refer to the following for maintenance actions required :
NOTE : Corrective action must be taken to prevent further hot starts.
(a)EGT 1383°F (751°C) to 1508°F (820°C) for less than 40 seconds - corrective action only
(b)EGT 1383°F (751°C) to 1508°F (820°C for longer than 40 seconds - corrective action and borescope of high pressure turbine blades
(c)EGT 1510°F (821°C) to 1598°F (870°C) for less than 40 seconds - corrective action and borescope of high pressure turbine blades.
(d)EGT 1510°F (821°C) to 1598°F (870°C) for longer than 40 seconds - corrective action and borescope of high pressure turbine blades. Three additional high pressure turbine blade borescope inspections required at 40-70 hour intervals with final inspection no sooner than 150 hours after overtemperature occurred.
(e)Over 1598°F (870°C) remove engine for overtemperature inspection. Engine must be disassembled and the hot section inspected per applicable manual sections.
(2)High EGT other than starting
When High EGT other than starting occurs refer to corresponding figure for maintenance action required (Ref. Fig. 601).
(3)Borescope inspection requirements for high EGT
(a)Whenever the high EGT maintenance action denotes a borescope



ENGINE OVERTEMPERATURE INSPECTION REQUIREMENTS (OTHER THAN STARTING)

NOTE:
IF THE ENGINE HAS BEEN OPERATED ABOVE 1015° C OR IN AREA A AND/OR B 15 TIMES, THE ENGINE MUST BE REMOVED FOR INSPECTION.

NOTE:
EACH SHADED AREA IS ABOVE, BUT DOES NOT INCLUDE, THE LOWER LIMIT OF TEMPERATURE AND TIME RANGES.

1025170-09-A

BM5 72 00 00 6 LAMA 00

Inspection Requirement Areas - High EGT Other Than Starting (Sheet 1/2)
Figure 601

EGT IN AREA A

1. NO MAINTENANCE IS NECESSARY IF CAUSE OF OVERTEMPERATURE IS KNOWN, BUT THE CAUSE OF THE OVERTEMPERATURE MUST BE CORRECTED.
2. IF CAUSE IS NOT KNOWN:
   A. DO A VISUAL INSPECTION OF THE ENGINE INLET BEFORE THE NEXT FLIGHT TO MAKE SURE THERE IS NO DAMAGE TO THE FAN INLET COWLING, FAIRINGS, FAN CASE, ACOUSTICAL PANELS, VANES, FAN BLADES, SPINNER, OR ADJACENT AREAS.
   B. DO A VISUAL INSPECTION OF THE EXHAUST NOZZLE BEFORE THE NEXT FLIGHT TO MAKE SURE THERE IS NO METAL CONTAMINATION WHICH SHOWS THAT DAMAGE HAS OCCURRED. EXAMINE LPT BLADES WHICH YOU CAN SEE FOR DAMAGE.
   C. DO A BORESCOPE INSPECTION OF THE HPT BLADES AT 20 FLIGHT CYCLES OR LESS.
3. EXAMINE ENGINE PERFORMANCE TREND FOR INDICATION OF EGT TREND SHIFT AND TO MAKE SURE ENGINE HAS A SERVICEABLE EGT MARGIN.

EGT IN AREA B

1. DO A VISUAL INSPECTION OF THE ENGINE BEFORE THE NEXT FLIGHT TO MAKE SURE THERE IS NO DAMAGE TO THE FAN INLET COWLING, FAIRINGS, FAN CASE, ACOUSTICAL PANELS, VANES, FAN BLADES, SPINNER, OR ADJACENT AREAS.
2. DO A VISUAL INSPECTION OF THE EXHAUST NOZZLE BEFORE THE NEXT FLIGHT TO MAKE SURE THERE IS NO METAL CONTAMINATION WHICH SHOWS THAT DAMAGE HAS OCCURRED. EXAMINE LPT BLADES WHICH YOU CAN SEE FOR DAMAGE.
3. DO A BORESCOPE INSPECTION OF THE HPT BLADES AT 20 FLIGHT CYCLES OR LESS.
4. EXAMINE ENGINE PERFORMANCE TREND FOR INDICATION OF EGT TREND SHIFT AND TO MAKE SURE ENGINE HAS A SERVICEABLE EGT MARGIN.

EGT IN AREA C

1. IF THE CAUSE OF THE INSPECTION IS NOT KNOWN, REMOVE THE ENGINE FOR AN OVERTEMPERATURE INSPECTION.
2. IF THE CAUSE OF THE HIGH EGT IS FOUND AND CORRECTED THE ENGINE MAY REMAIN IN SERVICE FOR 20 FLIGHT CYCLES BUT YOU MUST DO THE FOLLOWING:
   A. DO A VISUAL INSPECTION OF THE ENGNE INLET BEFORE THE NEXT FLIGHT TO MAKE SURE THERE IS NO DAMAGE TO THE FAN INLET COWLING, FAIRINGS, FAN CASE, ACOUSTICAL PANELS, VANES, FAN BLADES, SPINNER, OR ADJACENT AREAS.
   B. DO A VISUAL INSPECTION OF THE EXHAUST NOZZLE BEFORE THE NEXT FLIGHT TO MAKE SURE THERE IS NO METAL CONTAMINATION WHICH SHOWS THAT DAMAGE HAS OCCURRED. EXAMINE LPT BLADES WHICH YOU CAN SEE FOR DAMAGE.
   C. MAKE SURE THAT THE EGT INDICATION IS CORRECT AND A BORESCOPE INSPECTION FINDS THE HPT BLADES SERVICEABLE.

BM5 72 00 00 6 LAMJ 00

Inspection Requirement Areas - High EGT Other Than Starting (Sheet 2/2)
Figure 601

inspection, inspect the following areas of the HPT rotor
1 Stage 1 through borescope port B3-1
2 Stage 2 through borescope port B3-2 (only if stage 1 indicates need for further inspection/check).
NOTE : For manual N2 rotor cranking (Ref. 71-00-00, P. Block 501)
(b)Ref. 72-53-00, P. Block 601) for serviceable limits

B. Fan Overspeed Inspection
(1)If fan is operated at speeds from 117.5 percent (3854 rpm) to 124 percent (4067 rpm), the engine must be inspected as follows :
(a)Do a check of the fan rotor to make certain it turns freely.
(b)Examine the Stage 1 fan shroud for signs of too much rub (Ref. 72-23-00, P. Block 601).
(c)Examine the inlet and exhaust nozzles for particles.
(2)If fan speed exceeds 124 percent (4067 rpm), then fan rotor, fan mid-shaft, and LPT rotor must be removed, disassembled and inspected.

C. Core Overspeed Inspection
(1)If core engine rotor is operated at speeds from 112.5 percent (11055 rpm) to 114.0 percent (11202 rpm) the engine must be inspected as follows :
(a)Inspect exhaust nozzles for particles.
(b)Borescope inspect compressor rotor and stages 1 and 12 for blade damage.
(c)Borescope inspect HPT for blade damage.
NOTE : For manual N2 rotor cranking (Ref. 71-00-00, P. Block 501)
(2)If core engine rotor is operated above 114.0 percent (11202 rpm) the engine must be removed, disassembled and inspected per the Engine Manual.

D. Over-Serviceable-Limit Extensions
In the course of inspections/checks of the engine, there will be occasions when a specific defect will exceed the "Maximum Serviceable" limit. The corrective action given for the condition may exceed the maintenance capability at a given location. To permit the engine to be returned to a location where the defect can be corrected, or to permit the necessary maintenance to be scheduled within the extension period, the following extensions are provided :
NOTE : The limit extensions are a one-time extension only. Appropriate hardware action must be taken at the completion of the extended serviceable period.
(1)Fan module

CONDITION	MAXIMUM EXTENSION
(a)Fan Rotor Assembly :	
1 Stage 2, 3, 4 and 5 Blades.	
a Area A	5 Flight Cycles or 50 Flight Hours
b Area B	10 Flight Cycles or 100 Flight Hours
(b)Fan Forward Case Assembly :	
1 Missing microballoon material less than 30 in. (762 mm) long and less than total of 300 sq.in. (193,560 sq.mm)	100 Flight Hours
2 Damage to Kevlar containment	100 Flight Hours if the Kevlar

CONDITION	MAXIMUM EXTENSION
ring fiberglass cover	material is not damaged or could become damaged
3 Damaged acoustic panels - any amount of damage after removing loose material and frayed wire and edges	10 Flight Cycles or 100 Flight Hours
4 Loose bushings of acoustic panel	10 Flight Cycles provided there are no more than two loose bushings per panel
NOTE : Overlimit extensions for the acoustic panels are for both forward and aft panels.	
5 For fan cases without internal doublers - pre SB 72-0747 ; Corrosion 0.080 in. (2.03 mm) deep forward of the Kevlar containment, with a maximum cumulative length - any amount	350 flights or 875 flight hours
6 For fan cases with internal doublers - post SB 72-0747 ; Corrosion depth - any amount if there are no through-holes forward of the Kevlar containment, with a maximum cumulative length - any amount	350 flights or 875 flight hours
(c)Fan Frame and Case Assembly :	
1 Any amount of damage to acoustical panels AFT to fan blades	10 Flight Cycles or 100 Flight Hours
2 Aft inner liner aft brackets cracked	50 Flight Cycles/200 Flight Hours if there is no missing material. Crack can be any length, but must not connect more than one hole.
3 Aft inner liner forward brackets cracked	10 Flight Cycles or 100 Flight Hours if no other forward bracket holding the same panel is cracked. If there is only one forward bracket holding the panel, and if it is cracked, replace the panel. (Ref. 72-23-00, P. Block 801)
4 Bypass valve missing rivets	50 Flight Hours or 5 Flight Cycles
5 Bypass valve damaged/missing seal	Indefinite - no mechanical degradation, slight performance loss will occur
6 Damaged outlet guide vanes (OGVs).	10 Flight Cycles or 100 Flight Hours, whichever occurs first

CONDITION	MAXIMUM EXTENSION
7 OGV leading edge defects with total delamination less than 1.5 in. (38.1 mm) long and 0.5 in. (12.7 mm) deep	10 Flight Cycles or 100 Flight Hours, whichever occurs first
8 Cracks in the outlet guide vanes (OGVs) less than 1.0 in. (25.4 mm) long	10 Flight Cycles or 100 Flight Hours, whichever occurs first
9 Outlet guide vanes (OGVs), no more than two are gone	10 Flight Cycles or 100 Flight Hours, whichever occurs first
Post GE SB 72-719 (New Lightweight Flowpath Extensions)	
10 Flowpath extension has missing material	10 Flight Cycles or 100 Flight Hours, whichever occurs first
End Post GE SB 72-719	
11 Aft fan case corrosion (scales or pits)	25 Flight Cycles or 250 Flight Hours

(2)Core engine module

CONDITION	MAXIMUM EXTENSION
(a)Compressor Rotor Assembly :	
1 Radial tip crack in stages 10 and 11	10 Flight Cycles
2 Damage to stage 13 and 14 blades if more than the repairable limits for borescope blending (Ref. 72-31-00, P. Block 801)	Maximum of 1 Flight Cycle when upstream HPC damage, HPT damage, and vibration levels are in the serviceable limits
3 Damage to stage 1-14 blades if more than maximum serviceable limits	Maximum of 10 Flight Cycles if : 1. The damage is within repairable limits for borescope blending of HPC stage 1-14 rotor blades (Ref. 72-31-00, P. Block 801). 2. A maximum of one engine per aircraft has damage exceeding serviceable limits. 3. A borescope inspection of all stages has been performed and all blade damage is within blend repairable limits.
(b)Compressor Stator Case Assembly :	
1 Skin cracks less than 0.17 in. (4.3 mm) long, forward of stage 10	25 Flight Cycles
2 Forward circumferential flange cracks from bolt hole to skin	50 Flight Cycles
3 Stage 8 manifold end cap	Up to 5 Flight Cycles (but not

CONDITION	MAXIMUM EXTENSION
cracks	exceeding 30 Flight Hours)
4 Aft circumferential flange cracks radially inward from bolt hole	25 Flight Cycles
5 Manifold wear, chafing, or rub into skin	Indefinite- repetitive inspection at open cowl checks until repair, when the source of wear is corrected
(c)Variable Stator Vane (VSV) System (Air System) :	
1 Vane trunnion metal that touches the case bore metal	500 Flight Hours or 200 Flight Cycles after 50 percent of vanes in a stage that touches the case metal. If the outer bushing is replaced, this limit does not apply.

CAUTION : IF TOO MUCH LOAD IS APPLIED TO THE VSV ACTUATION SYSTEM, DAMAGE TO THE STATOR CASE BORES CAN OCCUR. DO NOT CONTINUE LONGER THAN THE RECOMMENDED MAXIMUM EXTENSION.

NOTE : It is recommended that an inspection of the compressor be done for blading distress/cracks before engine operation.

(d)Compressor Rear Frame :	
1 Front flange cracks	
a Into skin maximum length of 0.200 in. (5.08 mm)	50 Flight Cycles
b Into skin 0.200 in. (5.08 mm to 0.400 in. (10.16 mm) maximum	10 Flight Cycles
2 Leakage from the oil impingement manifold when engine oil is more than the limits (Ref. 71-00-00, P. Block 501).	10 Flight Cycles
R (e)Combustion section :	
R NOTE : Make sure that you refer to the maximum serviceable limits before the over serviceable limit extensions (Ref. 72-41-00, P. Block 601).	
R 1 Combustion inner/outer liners	
R a Circumferential cracks and connected cracks	25 Flight Cycles
R b Axial cracks and connected cracks	25 Flight Cycles
R c Inner liner burn through	25 Flight Cycles
R d Outer liner burn through	25 Flight Cycles
R e Metal that is gone from the overhang	25 Flight Cycles
R f Distortion	25 Flight Cycles
R g Other damage (If less than 20% damaged more than the limits)	25 Flight Cycles
R 2 Combustor dome assembly and cowls	
R NOTE : All maximum extension limits for the dome assembly and cowls table is applicable to Pre-LEC and Post-LEC configurations (GE SB 72-0840	

CONDITION	MAXIMUM EXTENSION
[field] or GE SB 72-0789 [production]).	
a Combustor dome splash plate circumferential cracks	25 Flight Cycles
b Combustor dome splash plate edge/radial cracks	25 Flight Cycles
c Combustor dome splash plate missing material	25 Flight Cycles
d Combustor dome splash plate edge erosion	25 Flight Cycles
e Dome inner and/or outer band cracks	5 Flight Cycles
f Other damage (If less than 20% damaged more than the limits)	25 Flight Cycles

(3)HPT module

CONDITION	MAXIMUM EXTENSION
(a)Stage 1 HPT Nozzle Assembly :	
1 Stage 1 HPT Vane	
a Stage 1 HPT vane leading edge Material that is gone or burns that go all the way through up to 0.5 sq.in. (323 sq.mm) for each airfoil ; maximum of 4 vanes for each 90 degree arc	25 Flight Cycles
b Stage 1 HPT vane concave and convex airfoil surface Material that is gone or burns that go all the way through up to 0.5 sq.in. (323 sq.mm) for each airfoil	25 Flight Cycles
c Trailing edge of vane airfoil. Material that is gone from cracking or burn-through up to 2.5 sq inch (1613 sq mm) per airfoil and up to an accumulated 10 sq in. (6452 sq mm) per assembly	25 Flight Cycles
d Stage 1 HPT vane inner and outer platform. Material that is gone or burns that go all the way through up to 0.5 sq.in. (323 sq.mm) for each airfoil and 2.0 sq.in. (1290 sq.mm) for each assembly.	25 Flight Cycles
e Inner and outer platform. Bulging and bowing	25 Flight Cycles
f Stage 1 HPT vane cracks that connect the nose holes and extend past the 6th film row of cooling holes on the concave side but do not extend past the 2nd film row of cooling holes on the convex side.	Reinspect at intervals of 100 flight cycles until the crack reaches the trailing edge. Once the crack reaches the trailing edge or extends past the 2nd film row of cooling holes on the convex side the limit is 25 Flight Cycles.
g Stage 1 HPT vane convex airfoil surface radial cracking where the material is lifted one side of the crack in relation to the other side by the thickness of the airfoil wall or greater	25 Flight Cycles
(b) Stage 2 HPT Nozzle Assembly	
1 All HPT stage 2 nozzle assembly	25 Flight Cycles

CONDITION	MAXIMUM EXTENSION
limits are allowed up to 20% beyond Serviceable Limits NOTE : Refer to SB GE 72-952 for more HPT stage 2 nozzle distress limits and maximum extension limits.	
(c)HPT Rotor Assembly	
1 Stage 1 HPT Rotor Blades Concave and Convex Surfaces, Area A	
a Radial cracks out-of-film holes that have turned axial	10 Flight Cycles
b Axial cracks in area A of less than distance between adjacent rows of cooling holes	10 Flight Cycles
c Radial cracks out-of-film holes in area A that have connected with next hole but have not turned axial	10 Flight Cycles
d Radial cracks out-of-film holes in area A that have connected three holes and have turned axial. Length less than distance between adjacent rows of film holes	10 Flight Cycles
e Radial cracks at tip- Any length provided they have not V-notched open, exposing internal cavity of blade	25 Flight Cycles
2 Stage 1 HPT Rotor Blades Concave and Convex Surfaces, Area A or B	
a Radial cracks in area A or B other than at gill holes or film holes, greater than 0.900 in. (22.86 mm)	10 Flight Cycles
3 Stage 1 HPT Rotor Blades, Leading Edge	
a One piece of missing material in leading edge in area A not larger in diameter than the spacing between 4 leading edge holes (0.36 in., 9.14 mm), providing there is not associated cracking. The internal cross over wall must be intact. Only four blades per rotor set.	10 Flight Cycles

CONDITION	MAXIMUM EXTENSION
4 Stage 1 HPT Rotor Blades, Leading Edge	
a Burns or parent metal oxidation greater than 0.3 in. (7.62 mm) in length (three cooling holes).	For burning or oxidation extending to 0.4 in. (10.16 mm) (four cooling holes), reduce borescope inspection intervals to 50 flight cycles. For burning or oxidation exceeding 0.4 in. (10.16 mm) (four cooling holes), reduce borescope inspection intervals to 25 flight cycles. If condition is stable after two reduced inspection intervals, inspection interval may return to previous inspection interval up to 250 cycles maximum.
b Axial cracks in Area A or Area B leading edge up to 0.1 in. (2.54 mm) long.	5 Flight Cycles
5 Stage 2 HPT Rotor Blades, Tip Area	
a Axial cracks any length within tip area.	10 Flight Cycles
b Cracks in the side of the platform into the airfoil above the filled	10 Flight Cycles
c Configuration 03: Material that is gone from the leading edge area A any radial length. Up to eight blades. All other restrictions of Maximum Serviceable Limits for this condition apply.	10 Flight Cycles

(4)LPT module

CONDITION	MAXIMUM EXTENSION
(a)Casing	
1 Cracks in casing welds or parent metal	25 Flight Cycles provided the crack does not exceed 4 in. (102 mm) and/or opening does not exceed 0.5 sq in. (323 sq mm) source
2 Cracks in boss pads	25 Flight Cycles provided the crack does not exceed 4 in. (102 mm)

CONDITION	MAXIMUM EXTENSION
3 Flange Cracks	and/or opening does not exceed 0.5 sq in. (323 sq mm) source 25 Flight Cycles - provided there are no more than four cracks per flange and the crack does not extend more than 0.250 in. (6.35 mm) into the casing
(b)LPT rotor	
1 Stage 1-5 blades. Any amount of tip shroud interlock wear allowed. No missing airfoil or missing tip shrouds allowed. Impact damage is allowed provided missing material or cracks do not exceed 50 percent of chord width in outer half of blade and 25 percent of chord width in inner half of blade	10 Flight Cycles
2 HPT leaf seals wrapped around airfoil	25 Flight Cycles
(c)Core (N2)	
1 Overspeed inspection 112.5 percent (11055 rpm) to 114.0 percent (11202 rpm)	10 Flight Cycles
(d)Fan (N1)	
1 Overspeed inspection 117.5 percent (3854 rpm) to 124.0 percent (4067 rpm)	10 Flight Cycles
(5)Accessory drive module	
(a)Accessory gearbox (AGB)	

CONDITION	MAXIMUM EXTENSION
1 Oil Leakage from magnetic carbon seals/preformed packing in AGB drive pads.	10 Flight Cycles, if seal drain line is disconnected from drain module and plugged. NOTE : Replace magnetic carbon seals/preformed packing at first opportunity, remove drain line plug and connect drain line to AGB.
(b)N1 control adapter	
1 Oil leakage from magnetic carbon seals	10 Flight Cycles

NOTE : 1 For maximum allowable leakage rate refer to 71-70-00, P. Block 201

2 Plugging of the drain lines not permitted if leakage is fuel or hydraulic fluid. Identify leakage as being engine oil from the accessory gearbox only, before you plug the lines.

(6)EGT thermocouple probe

CONDITION	MAXIMUM EXTENSION
(a)Thermocouple Harness pigtail leads :	
1 Breakage on either alumal or chromal probe attachment points, which has caused the EGT indication to fluctuate	10 Flight Cycles - one per engine, but not both conditions at the same time, until the problem can be corrected by the necessary maintenance.
2 Low I/R resistance of an EGT probe, which has caused a down/up shift of 20° - 30°C (68° - 86°F) of the indicated EGT	

NOTE : Disconnect the thermocouple harness pigtail leads from the EGT probes. Insulate them from each other and connect them to the harness with a clamp.

7. Special Inspections

A. No Oil Pressure - Inspection

(1)If the engine has been operated without oil pressure at ground idle or above, examine the lube filters, screen, magnetic plugs and isolation plugs (if installed). Look for metal/debris. If metal chips and/or debris are found, drain and replace oil (Ref. 12-13-79, P. Block 1 and 79-00-00, P. Block 301).

(2)If the engine was operated without oil pressure for longer than limits a, b or c the engine must be removed. The engine must be disassembled and have an inspection done by the limits in the shop manual.

a Takeoff power for 30 seconds.

b Cruise power for 45 seconds.

c Idle (minimum or approach) for 2 minutes.

NOTE : There are no time limits for wind will operation if the engine has been normally operated (engine parts that must have lubrication will have been oil-wetted).

(a)If later flights will be made with a wind milling engine, servicing of the oil tank must be done before each flight.

NOTE : Fuel must be available to the engine driven fuel pump for lubrication and cooling.

CAUTION : **CORROSION DAMAGE BECAUSE OF CONDENSATION THAT GETS ON LUBE-WETTED PARTS (BEARING, GEARS, ETC.) MUST BE PREVENTED. DRY THE OIL-WETTED AREAS AS SOON AS POSSIBLE AFTER THE AIRCRAFT HAS LANDED.**

(3)If there was an inflight shut down and the engine was operated with no oil pressure, dry out the engine (Ref. 72-00-00, P. Block 201).

NOTE : This procedure is not necessary if the engine will be operated not more than 48 hours after landing. If the engine is operated at minimum idle for 3 minutes, the drying/lubricating effect is the same as the 10 day preservation procedure.

B. Engine Post-Windmilling Inspection

(1)Correct the cause of the inflight shutdown as applicable.

(2)Service the oil tank (Ref. 12-13-79, P. Block 1).

(3)Operate the engine at minimum idle speed for 3 minutes minimum (Ref. 71-00-00, P. Block 501). Do this as soon as possible after aircraft landing.

NOTE : The engine dry out procedure (ten day preservation) may be done as an alternative (Ref. 72-00-00, P. Block 201).

C. Oil System Contamination

Any engine with oil system contamination caused by fuel, hydraulic fluid, or other contaminates must have the maintenance procedures to clean the oil system. This is along with the maintenance necessary to correct the cause of the problem :

(1)Drain the oil system and accessory gearbox.

(a)If the oil system has contamination caused by hydraulic fluid, inspect/check the drain lines and clean the drain module.

(2)Refill the oil system.

(3)Ground run the engine at 75 % N1 for a minimum of 3 minutes.

(4)Drain the oil system.
(5)Refill the oil system.

D. Accident or Incident Inspection
Any engine that had an accident, incident or other unusual exposure must follow special inspection and parts disposition. Any engine exposed to unusual conditions could have to follow special inspection and part dispositions that are more than regular operation and limits. Some of the unusual conditions to which an engine may operate in are :
(1)Shock loading, collision, crash damage, separation from the aircraft, handling or transportation accident.
(2)Structural overstress caused by the engine structure that holds the weight of the aircraft during a failure or separation of the landing gear.
(3)Sudden seizure or stoppage of the engine rotor or rotors.
(4)Very high G-loading during operation.
(5)Very high ingestion incidents.
(6)Fire exposure :
(a)Fire on all or part of the aircraft.
(b)Post-crash engine external fire, engine only.
(c)Engine undercowl fire.
(d)Fire in storage or transport.
(7)Submersion into water that causes the engine to cool while operating, or not at stabilized, shut down temperatures.
(8)Exposure to corrosives, chemicals, salt water or sewage ; post-accident unprotected storage.
(9)Hit or explosion from bomb, rocket or missile attack.
These incidents and the conditions to which engines are exposed can not be known. This prevents you to make a single, standard procedure. Before you do post-accident procedures to make sure of airworthiness, write to the address below for special inspection requirements :
GE Aircraft Engines
Commercial Engine Product Support Department
Attention : Director of Customer Support
1 Neumann Way M/D Room 450
Cincinnati, Ohio 45215-1988 (USA)

E. Excessive Vertical and Loading Inspection
Any engine suspected of excessive vertical and loading during transportation requires special inspection to determine serviceability.

F. Fan Blade Shingling Inspection
WARNING : THERE IS A POSSIBLE HEALTH RISK TO PERSONNEL WHO DO MAINTENANCE TASKS AFTER A BIRD STRIKE. THE SAFETY MEASURES THAT FOLLOW ARE RECOMMENDED.
- USE DISPOSABLE GLOVES.
- USE A DISPOSABLE COVERALL IF THERE IS A RISK OF BODY CONTACT WITH THE BIRD REMAINS.
- DO NOT USE PRESSURIZED AIR OR WATER TO CLEAN THE PARTS WHICH WERE IN CONTACT WITH THE BIRD.
- REMOVE THE BIRD REMAINS AND PUT THEM IN A PLASTIC BAG.

- DO NOT TOUCH YOUR FACE, EYES, NOSE, ETC. WITH YOUR GLOVES.
- REMOVE THE GLOVES AND THE DISPOSABLE COVERALL AND PUT THEM IN THE SAME PLASTIC BAG AS THE REMAINS. SEAL THE BAG.
- DISCARD THE BAG AS YOU DO FOR USUAL GARBAGE.
- CAREFULLY WASH YOUR HANDS WITH SOAP AND WATER.

Fan blade shingling (overlapping of mid-span shrouds) may be caused by an engine stall, bird strike, FOD or engine overspeed. If any of these events have occurred, inspect for possible fan blade shingling as follows :

(1)Check both upper and lower surfaces of mid span shrouds for chafing/scoring adjacent to the interlock surfaces. All blades that are overlapped or show indications of overlapping must be inspected (Ref. 72-21-00, P. Block 601) as follows :

(a)Use a strong light source and do a visual inspection of the midspan shrouds for cracks. No cracks are permitted.

CAUTION : OVERLAPPED BLADES MUST BE REPLACED WITHIN THE 50 HOUR LIMITATION OR DAMAGE MAY PROGRESS BEYOND SHOP MANUAL REPAIRABLE LIMITS.

(2)All blades that have misaligned midspan shrouds and are in the serviceable limits must be replaced in less than 50 flight hours. You must replace the blades in this time limit even though they are in the serviceable limits of 72-21-00, P. Block 601. Send removed blades to the shop for inspection and repair.

(3)Inspect/check fan forward casing abradable material (Ref. 72-22-00, P. Block 601).

G. Stall Inspection

If a stall or suspected stall has occurred, the following inspection for engine stall must be accomplished :

(1)Borescope inspect compressor rotor stages 1 and 12 blades (Ref. 72-31-00, P. Block 601).

(2)Borescope inspect high pressure turbine rotor (Ref. 72-53-00, P. Block 601).

(3)Remove magnetic probe from magnetic plug and inspect for metal flakes (Ref. 79-22-03, P. Block 401).

NOTE : For manual N2 rotor cranking (Ref. 71-00-00, P. Block 501)

NOTE : Abnormal material collected by the magnetic plug should be evaluated for oil wetted parts distress.

(4)Perform Pull/Travel Check of VSV feedback cable; inspect cable, brackets and linkage, including MEC linkage (Ref. 73-21-01, P. Block 601).

(5)Check VSV feedback system rig (Ref. 73-21-01, P. Block 601), if misaligned in the open direction more than 0.050 in. (1.27 mm) from the nominal schedule (rig line), consider as probable cause of stall. Troubleshoot VSV feedback system to determine cause of rig change and correct.

(6)Perform pressure check of CIT Sensor (Ref. 73-21-02, P. Block 601).

(7)Inspect/Check all VSV actuation hardware for damage. Pay particular attention to the following :

(a)VSV Lever Arms (Ref. 72-32-00, P. Block 601).

(b)Actuation Rings and Connector Links (Ref. 72-32-00, P. Block 601).

(c)Pushrods (Ref. 72-32-00, P. Block 601).

(d)Actuation Ring Spacers and clearance (Ref. 72-32-00, P. Block 601).
(e)VSV Actuator Mount Bracket.
(f)VSV Actuation Lever Bracket.
(8)If facilities are available, it is recommended that engine be cleaned per Cleaning/Painting Section (Ref. 72-00-00, P. Block 701).

H. Volcanic Ash or Sand/Dust Storm Inspection
The following requirements are subsequent to incident of volcanic ash or sand/dust storm ingestion.
NOTE : The following checks must be carried out if the incidents have been accompanied by a noticeable change in the engine behavior.
(1)Visually check engine inlet and exhaust areas for evidence of damage or excessive erosion.
(2)Borescope inspect high pressure compressor and high pressure turbine for evidence of the following :
(a)Excessive erosion
(b)Foreign object damage (FOD)
(c)Build up of ash deposits.
(3)Oil system
(a)Replace scavenge oil filter
(b)Drain and replace oil (Ref. 72-00-00, P. Block 501).
(4)Monitor engine operation to determine if a shift in performance parameters has occurred. If parameters are abnormal, refer to trouble-shooting procedures.

I. Air System Failures Stage 7 Cooling Air System
(1)If a failure condition is detected in stage 7 cooling air system and leads to a loss of cooling air, perform the following actions to determine engine serviceability.
NOTE : The cooling air system consists of clamps, elbows, tubes, and manifolds which supply both right and left side stage 7 compressor air from stator case manifolds to low pressure stage 1 nozzles (Ref. 75-00-00 for system details).
(a)Look for :
1 Tubes having a loss of air with open cracks or missing material with a total accumulated area of 0.25 sq.in. (161 sq.mm) or larger.
2 Tubes having a loss of air with cracks through 360 degrees of circumference.
(2)If left side or right side stage 7 tubing failure is more than the serviceability requirements, perform the following actions to determine the extension limits (Ref. Fig. 602).
NOTE : The number of cycles for which the nacelle temperature has increased can be used to help determine the number of cycles the cooling air loss has existed or an event may be indicated by an open blow out door where the failed condition occurred on a previous flight.
(a)If the cooling air loss has been for 450 cycles or less, the engine may continue in service provided :
1 the fan rotor may be rotated freely by hand
2 the failure condition is corrected (Ref. 72-09-03, P. Block 601).
NOTE : If a cooling air loss has occured more than once since the

most recent LPT module overhaul, the total number of accumulated cycles of all events is limited to 450 cycles.

(b)If the cooling air loss has been for more than 450 cycles, either in a single occurence or the cumulative cycles for two or more occurences since the last LPT overhaul, the engine may continue in service for an additional 50 cycles provided :

1 the fan rotor rotates freely by hand
2 the failure condition is corrected (Ref. 72-09-03, P. Block 601)
3 overtemperature inspection of LPT rotor stage 1 and stage 2 disks, HPT stage 2 disk, and stage 2 blade retainer is performed at next rotor overhaul.

(c)If the cooling air loss has been for an unknown number of cycles with one or more failure events since the previous LPT overhaul, the engine may continue in service for an additional 50 cycles provided :

1 the fan rotor rotates freely by hand
2 the failure condition is corrected (Ref. 72-09-03, P. Block 601)
3 overtemperature inspection of LPT rotor stage 1 and stage 2 disks, HPT stage 2 disk, and stage 2 blade retainer is performed at next rotor overhaul.

(d)If the cooling air loss has existed in both systems for any number of cycles, the engine may continue in service to return to maintenance base provided :

1 the fan rotor rotates freely by hand
2 the failure condition is corrected (Ref. 72-09-03, P. Block 601)
3 the engine is removed at maintenance base (Ref. 71-00-00, P. Block 401)
4 overtemperature inspection of LPT rotor stage 1 and stage 2 disks and HPT stage 2 disk is performed when engine is removed from aircraft. HPT stage 2 blade retainer must be replaced. Scrap old retainer.

J. Air System Failures - Stage 11 Cooling Air System

(1)If a failure condition is detected in the stage 11 cooling air system and leads to a loss of cooling air, perform the following actions to determine engine serviceability.

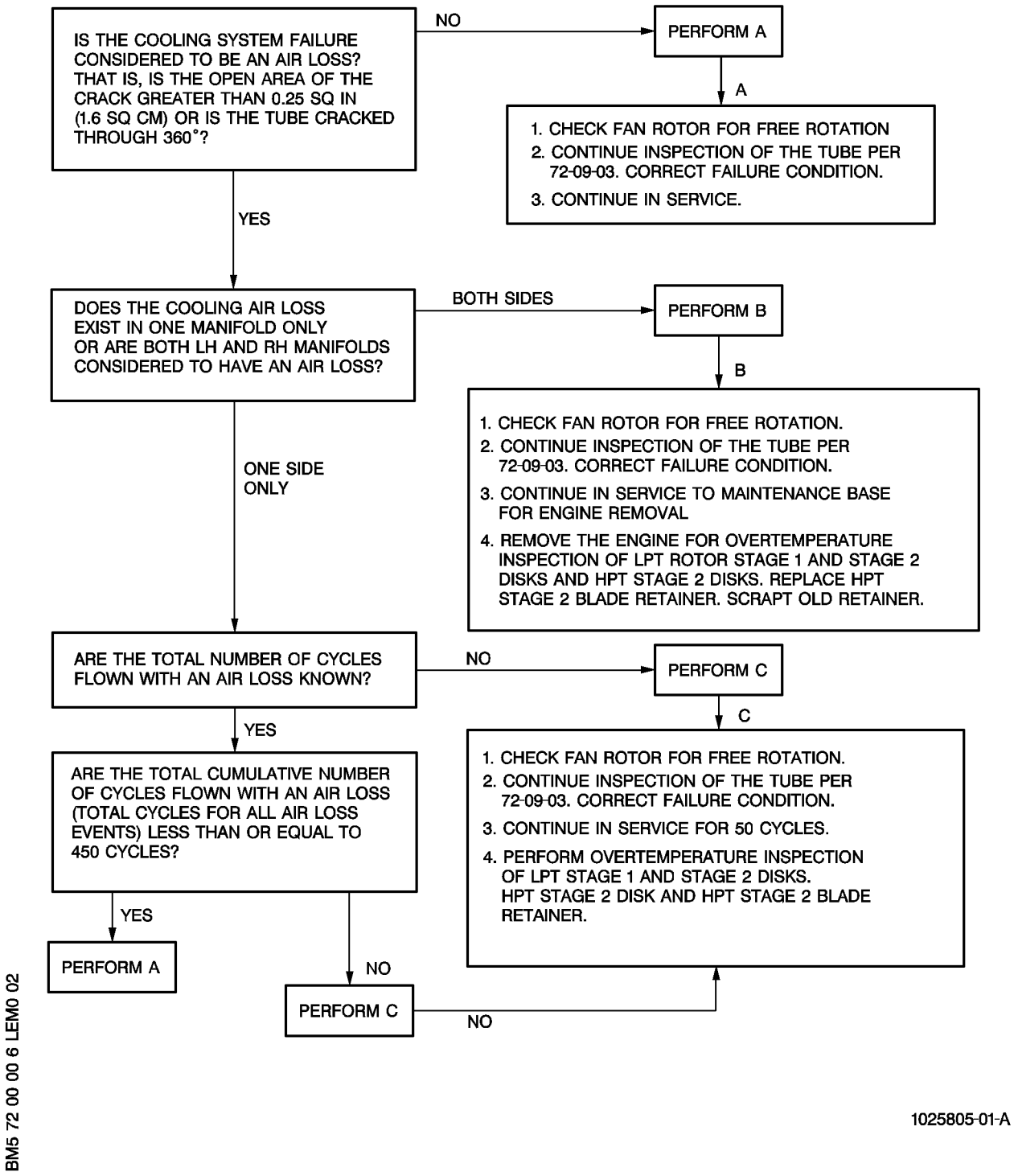
NOTE : The cooling air system consists of clamps, elbows, tubes, and manifolds which supply stage 11 compressor air from stator case manifolds to high pressure stage 1 nozzles.

(a)Look for :

1 Tubes that have a loss of air with open cracks or missing material with a total accumulated area of 0.25 sq.in. (161 sq.mm) or larger.
2 Tubes that have a loss of air with cracks through 360 degrees of circumference.

(2)If stage 11 tubing failure is more than the serviceability requirements, perform the following actions to determine the extension limits (Ref. Fig. 603, 604, 605).

NOTE : The number of cycles for which the nacelle temperature has increased can be used to help determine the number of cycles the cooling air loss has existed or an event may be indicated by an open blow out door where the failed condition occurred on a previous flight.


IS THE COOLING SYSTEM FAILURE CONSIDERED TO BE AN AIR LOSS? THAT IS, IS THE OPEN AREA OF THE CRACK GREATER THAN 0.25 SQ IN (1.6 SQ CM) OR IS THE TUBE CRACKED THROUGH 360°?
NO
PERFORM A
A
1. CHECK FAN ROTOR FOR FREE ROTATION
2. CONTINUE INSPECTION OF THE TUBE PER 72-09-03. CORRECT FAILURE CONDITION.
3. CONTINUE IN SERVICE.
YES
DOES THE COOLING AIR LOSS EXIST IN ONE MANIFOLD ONLY OR ARE BOTH LH AND RH MANIFOLDS CONSIDERED TO HAVE AN AIR LOSS?
BOTH SIDES
PERFORM B
B
1. CHECK FAN ROTOR FOR FREE ROTATION.
2. CONTINUE INSPECTION OF THE TUBE PER 72-09-03. CORRECT FAILURE CONDITION.
3. CONTINUE IN SERVICE TO MAINTENANCE BASE FOR ENGINE REMOVAL
4. REMOVE THE ENGINE FOR OVERTEMPERATURE INSPECTION OF LPT ROTOR STAGE 1 AND STAGE 2 DISKS AND HPT STAGE 2 DISKS. REPLACE HPT STAGE 2 BLADE RETAINER. SCRAPT OLD RETAINER.
ONE SIDE ONLY
ARE THE TOTAL NUMBER OF CYCLES FLOWN WITH AN AIR LOSS KNOWN?
NO
PERFORM C
C
1. CHECK FAN ROTOR FOR FREE ROTATION.
2. CONTINUE INSPECTION OF THE TUBE PER 72-09-03. CORRECT FAILURE CONDITION.
3. CONTINUE IN SERVICE FOR 50 CYCLES.
4. PERFORM OVERTEMPERATURE INSPECTION OF LPT STAGE 1 AND STAGE 2 DISKS. HPT STAGE 2 DISK AND HPT STAGE 2 BLADE RETAINER.
YES
ARE THE TOTAL CUMULATIVE NUMBER OF CYCLES FLOWN WITH AN AIR LOSS (TOTAL CYCLES FOR ALL AIR LOSS EVENTS) LESS THAN OR EQUAL TO 450 CYCLES?
YES
PERFORM A
NO
PERFORM C
NO
1025805-01-A
BM5 72 00 00 6 LEM0 02

Stage 7 Air System Failure
Figure 602

Pre SB GE 75-078 *** (ENGINES WITHOUT CHECK VALVES)

(a)If the cooling air loss is for one event for an unknown number of cycles since engine installation, the engine may continue in service an additional 50 cycles provided :

1 the failure condition is corrected

2 overtemperature inspection of the HPT rotor is performed when the engine is removed from the aircraft.

(b)If the cooling air loss is for two or more events for an unknown number of cycles or the number of air loss events is unknown since engine installation, remove the engine at next maintenance base provided :

1 the failure condition is corrected

2 overtemperature inspection of the HPT rotor is performed when the engine is removed from the aircraft.

(c)If the total accumulated area of the crack is less than or equal to 0.5 sq.in. (323 sq.mm) and the cooling air loss has been for 300 cycles or less, either in a single event or the accumulative cycles of two or more events since engine installation, the engine may continue in service provided :

1 the failure condition is corrected

2 borescope inspection of the HPT stage 2 nozzle shows no signs of distress

3 overtemperature inspection of the HPT rotor is performed at the next rotor overhaul.

(d)If the total accumulated area of the crack is less than or equal to 0.5 sq.in. (323 sq.mm) and the cooling air loss has been for more than 300 cycles, either in a single event or the accumulative cycles of two or more events since engine installation, the engine may continue in service an additional 50 cycles provided :

1 the failure condition is corrected

2 overtemperature inspection of the HPT rotor is performed when the engine is removed from the aircraft.

(e)If the total accumulated area of the crack is greater than 0.5 sq.in. (323 sq.mm) and the cooling air loss has been for 10 cycles or less, either in a single event or the accumulative cycles of two or more events since engine installation, the engine may continue in service provided :

1 the failure condition is corrected

2 borescope inspection of the HPT stage 2 nozzle shows no signs of distress

3 overtemperature inspection of the HPT rotor is performed at the next rotor overhaul.

(f)If the total accumulated area of the crack is greater than 0.5 sq.in. (323 sq.mm) and the cooling air loss has been for more than 10 cycles, either in a single event or the accumulative cycles of two or more events since engine installation, the engine may continue in service an additional 50 cycles provided :

1 the failure condition is corrected

2 overtemperature inspection of the HPT rotor is performed when the engine is removed from the aircraft.

End Pre SB GE 75-078

Post SB GE 75-078 *** (ENGINES WITH CHECK VALVES)

(g)If the cooling air loss is for one event for an unknown number of cycles since engine installation, the engine may continue in service an additional 50 cycles provided :

1 the failure condition is corrected

2 overtemperature inspection of the HPT rotor is performed when the engine is removed from the aircraft.

(h)If the cooling air loss is for two or more events for an unknown number of cycles or the number of air loss events is unknown since engine installation, remove the engine at next maintenance base provided :

1 the failure condition is corrected

2 overtemperature inspection of the HPT rotor is performed when the engine is removed from the aircraft.

(i)If the cooling air loss has occurred downstream of the check valve, refer to paragraph K.(2)(a) thru (f), for engines without check valves.

(j)If the cooling air loss has been for 300 cycles or less, either in a single event or the accumulative cycles of two or more events since engine installation, the engine may continue in service provided :

1 the failure condition is corrected

2 borescope inspection of the HPT stage 2 nozzle shows no signs of distress

3 overtemperature inspection of the HPT rotor is performed at the next rotor overhaul.

(k)If the cooling air loss has been for more than 300 cycles, either in a single event or the accumulative cycles of two or more events since engine installation, the engine may continue in service an additional 50 cycles provided :

1 the failure condition is corrected

2 borescope inspection of the HPT stage 2 nozzle shows no signs of distress

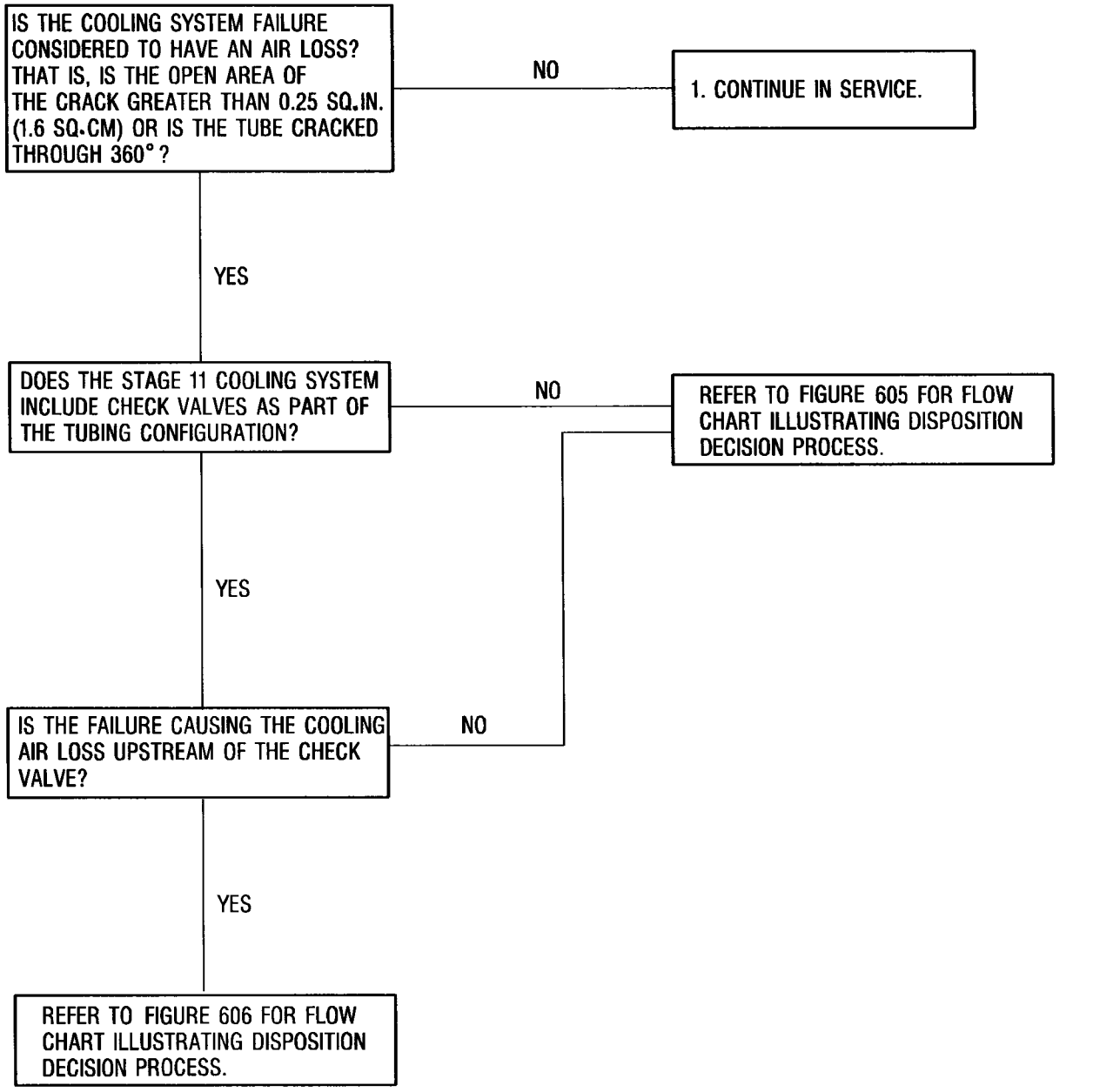
3 overtemperature inspection of the HPT rotor is performed at the next rotor overhaul.

End Post SB GE 75-078

K. Variable Stator Vane (VSV) Off-Schedule Operation/Inspection Requirements

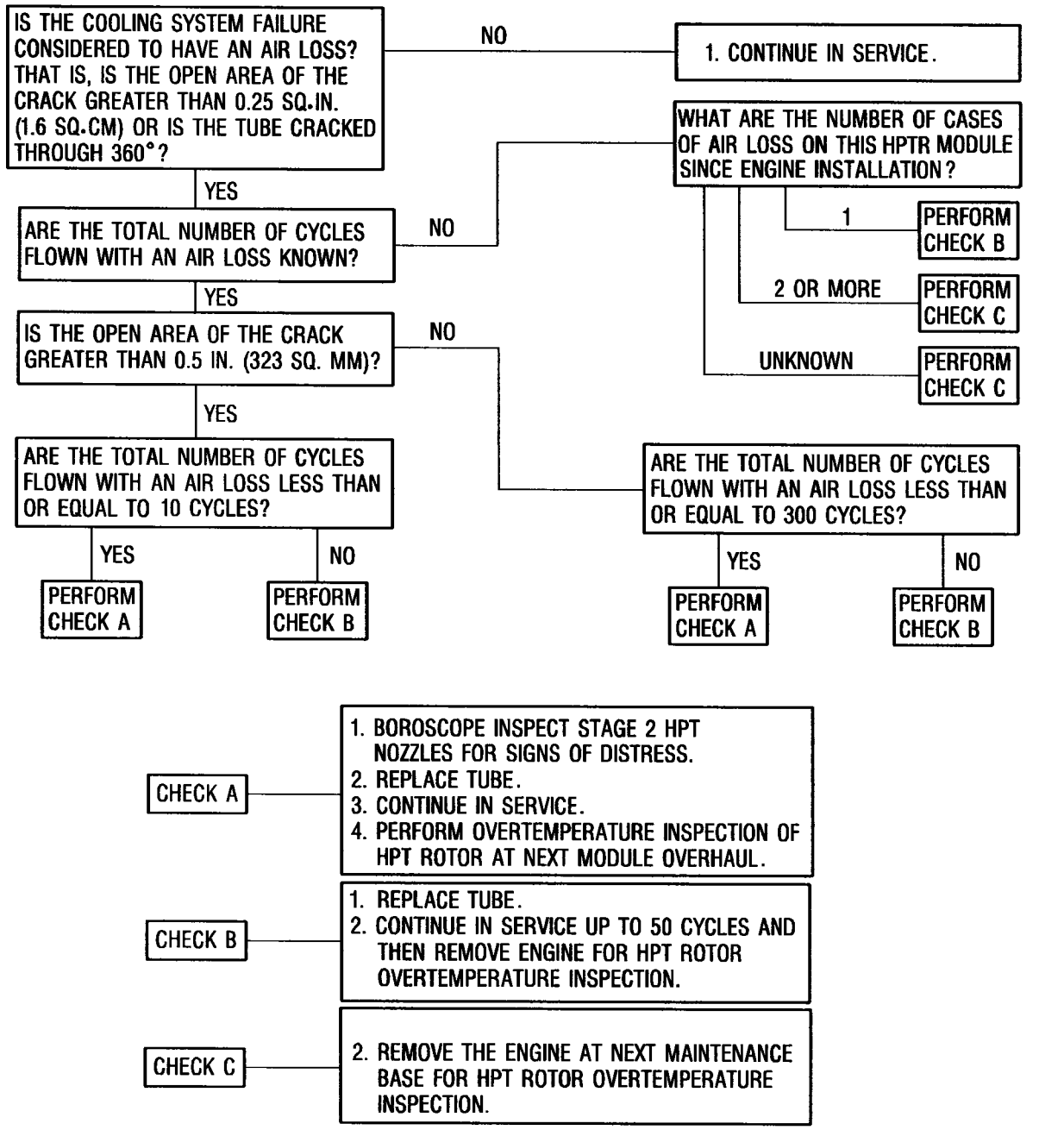
Engines operated with misassembled, bent, or broken lever arms and broken connector links will result in an off-schedule vane condition which requires a special inspection and subsequent maintenance action. If vane levers are found bent during normal inspection, the degree of bending determines the maintenance action required. Check the following items to determine required maintenance action.

NOTE : Action required is based on results of inspection using tools 2C6962G03, 2C6966G05, or 2C8016G01 to determine degrees of bend. Record the stage and engine which contain distressed lever arms or connector links. Use care to keep affected compressor blades specially delineated until appropriate action can be determined.


IS THE COOLING SYSTEM FAILURE CONSIDERED TO HAVE AN AIR LOSS? THAT IS, IS THE OPEN AREA OF THE CRACK GREATER THAN 0.25 SQ.IN. (1.6 SQ.CM) OR IS THE TUBE CRACKED THROUGH 360° ?
NO
1. CONTINUE IN SERVICE.
YES
DOES THE STAGE 11 COOLING SYSTEM INCLUDE CHECK VALVES AS PART OF THE TUBING CONFIGURATION?
NO
REFER TO FIGURE 605 FOR FLOW CHART ILLUSTRATING DISPOSITION DECISION PROCESS.
YES
IS THE FAILURE CAUSING THE COOLING AIR LOSS UPSTREAM OF THE CHECK VALVE?
NO
YES
REFER TO FIGURE 606 FOR FLOW CHART ILLUSTRATING DISPOSITION DECISION PROCESS.
1125807-00-A

BM5 72 00 00 6 LFM0 00

Stage 11 Cooling Air System Failure-
Determination of Disposition Flow Chart
Figure 603

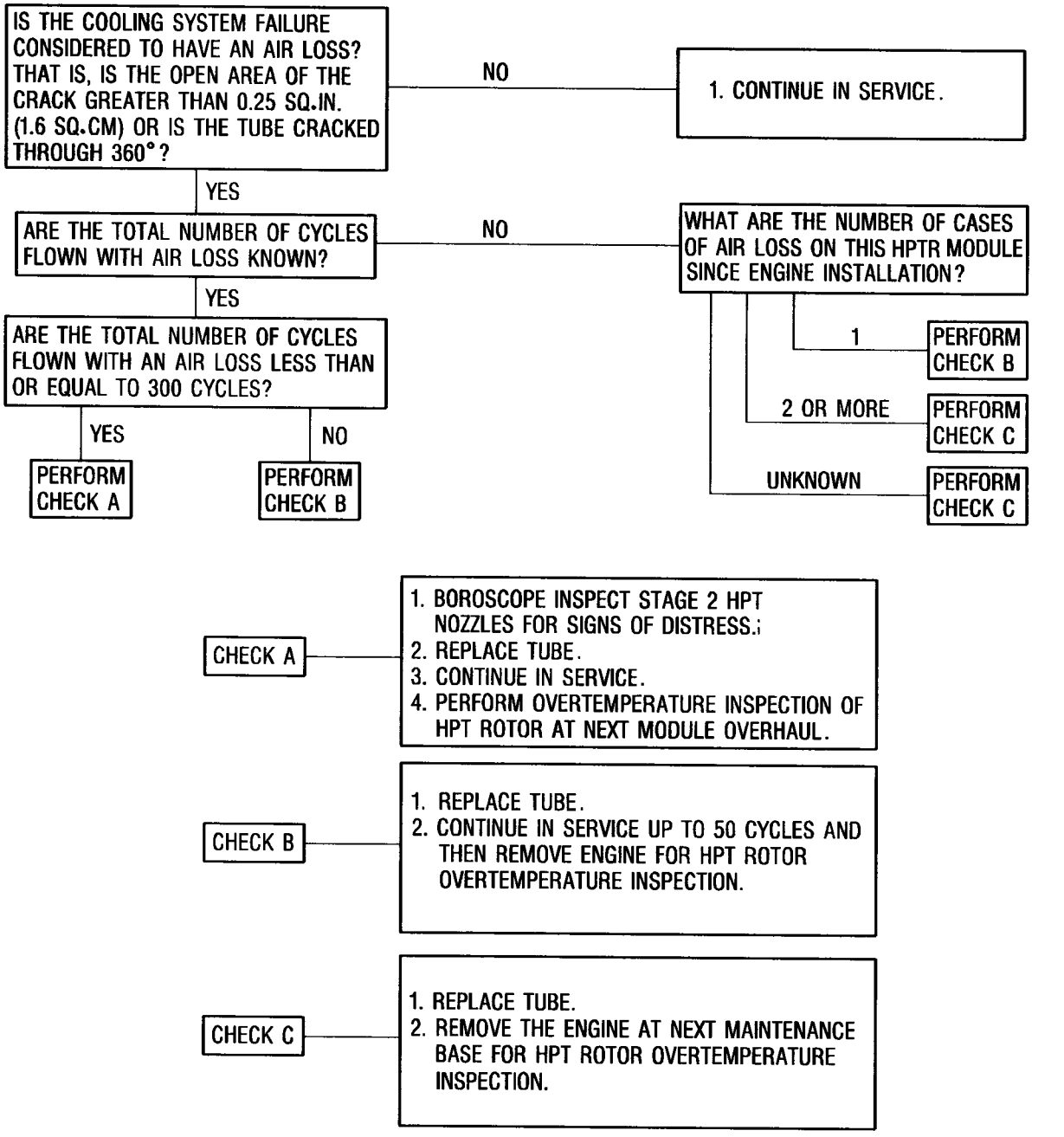

IS THE COOLING SYSTEM FAILURE CONSIDERED TO HAVE AN AIR LOSS? THAT IS, IS THE OPEN AREA OF THE CRACK GREATER THAN 0.25 SQ.IN. (1.6 SQ.CM) OR IS THE TUBE CRACKED THROUGH 360°?
NO
1. CONTINUE IN SERVICE.
YES
ARE THE TOTAL NUMBER OF CYCLES FLOWN WITH AN AIR LOSS KNOWN?
NO
WHAT ARE THE NUMBER OF CASES OF AIR LOSS ON THIS HPTR MODULE SINCE ENGINE INSTALLATION?
1
PERFORM CHECK B
2 OR MORE
PERFORM CHECK C
UNKNOWN
PERFORM CHECK C
YES
IS THE OPEN AREA OF THE CRACK GREATER THAN 0.5 IN. (323 SQ. MM)?
NO
YES
ARE THE TOTAL NUMBER OF CYCLES FLOWN WITH AN AIR LOSS LESS THAN OR EQUAL TO 10 CYCLES?
YES
NO
PERFORM CHECK A
PERFORM CHECK B
ARE THE TOTAL NUMBER OF CYCLES FLOWN WITH AN AIR LOSS LESS THAN OR EQUAL TO 300 CYCLES?
YES
NO
PERFORM CHECK A
PERFORM CHECK B

CHECK A
1. BOROSCOPE INSPECT STAGE 2 HPT NOZZLES FOR SIGNS OF DISTRESS.
2. REPLACE TUBE.
3. CONTINUE IN SERVICE.
4. PERFORM OVERTEMPERATURE INSPECTION OF HPT ROTOR AT NEXT MODULE OVERHAUL.
CHECK B
1. REPLACE TUBE.
2. CONTINUE IN SERVICE UP TO 50 CYCLES AND THEN REMOVE ENGINE FOR HPT ROTOR OVERTEMPERATURE INSPECTION.
CHECK C
2. REMOVE THE ENGINE AT NEXT MAINTENANCE BASE FOR HPT ROTOR OVERTEMPERATURE INSPECTION.

1125808-00-A

BM5 72 00 00 6 LGMO 00

Stage 11 Cooling Air System Failure-
without Check Valve System
Figure 604


IS THE COOLING SYSTEM FAILURE CONSIDERED TO HAVE AN AIR LOSS? THAT IS, IS THE OPEN AREA OF THE CRACK GREATER THAN 0.25 SQ.IN. (1.6 SQ.CM) OR IS THE TUBE CRACKED THROUGH 360° ?
NO
1. CONTINUE IN SERVICE.
YES
ARE THE TOTAL NUMBER OF CYCLES FLOWN WITH AIR LOSS KNOWN?
NO
WHAT ARE THE NUMBER OF CASES OF AIR LOSS ON THIS HPTR MODULE SINCE ENGINE INSTALLATION?
1
PERFORM CHECK B
2 OR MORE
PERFORM CHECK C
UNKNOWN
PERFORM CHECK C
YES
ARE THE TOTAL NUMBER OF CYCLES FLOWN WITH AN AIR LOSS LESS THAN OR EQUAL TO 300 CYCLES?
YES
PERFORM CHECK A
NO
PERFORM CHECK B
CHECK A
1. BOROSCOPE INSPECT STAGE 2 HPT NOZZLES FOR SIGNS OF DISTRESS.
2. REPLACE TUBE.
3. CONTINUE IN SERVICE.
4. PERFORM OVERTEMPERATURE INSPECTION OF HPT ROTOR AT NEXT MODULE OVERHAUL.
CHECK B
1. REPLACE TUBE.
2. CONTINUE IN SERVICE UP TO 50 CYCLES AND THEN REMOVE ENGINE FOR HPT ROTOR OVERTEMPERATURE INSPECTION.
CHECK C
1. REPLACE TUBE.
2. REMOVE THE ENGINE AT NEXT MAINTENANCE BASE FOR HPT ROTOR OVERTEMPERATURE INSPECTION.
1125809-00-A

BM5 72 00 00 6 LHM0 00

Stage 11 Cooling Air System Failure-
with Check Valve System
Figure 605

ITEM	ACTION REQUIRED
(1)Lever arm bent 2° or less	No corrective action
(2)Lever arm bent more than 2° but not more than 4°	Replace lever arm
(3)Lever arm bent more than 4° or lever arm broken	Not serviceable. Replace engine.
(4)Lever arm misassembled	Measure off-schedule angle before replacing lever arm. If more than 4°, the problem is not serviceable. Replace engine.
(5)Actuation ring or connector link broken	Not serviceable. Replace engine.

L. Hailstone Ingestion

(1)Visually inspect the fan outlet guide vanes following an incident of hailstone ingestion for any evidence of damage.

M. A- and D- Sump Vent Inspection

(1)Remove the turbine exhaust plug (Ref. 78-11-02, P. Block 401).
(2)Remove the insulation blanket, sump cover and oil slinger as follows : (Ref. Fig. 606).
WARNING : THE INSULATION BLANKETS CAN CONTAIN CERAMIC FIBERS THAT CAN CAUSE IRRITATION TO YOUR SKIN, EYES AND LUNGS. USE SKIN, EYE, AND LUNG PROTECTION.
(a)Remove the eight nuts that attach the insulation blanket and sump cover to the aft sump housing.
(b)Remove the insulation blanket and sump cover.
(c)Remove the seven nuts that attach the oil slinger to the studs on the No. 6 bearing spanner nut.
(d)Remove the oil slinger.
(3)Visually inspect the sump cover and oil slinger for an indication of distortion. Replace if damaged.
(4)If the oil slinger is distorted and the engine has the CVT flame arrestor installed, refer to SB GE 72-648.
(a)Examine the oil supply line and scavenge line clamps for :
1 Clamp material burned away.
2 Evidence of fire in the centerbody cavity (smell and/or visual).
(b)If evidence of fire was found, remove the engine due to possible heat distress (Ref. 71-00-00, P. Block 401).
(5)Visually inspect the sump cover preformed packing for an indication of heat distress. Replace the preformed packing.
(6)Install the insulation blanket, sump cover, and oil slinger as follows :
(a)Install the oil slinger to the studs on the No. 6 bearing inner nut.
(b)Apply Material No.C02-071 (primary) or C02-058 (alternative) to the threads and washer faces of the seven nuts.
(c)Attach the oil slinger to the spanner nut with seven nuts. TORQUE the nuts to between 33 and 37 lbf.in. (0.37 and 0.42 m.daN). Clean off all unwanted lubricant.
(d)Apply Material No.C02-033 to a new preformed packing.

Apply Material No.C02-033 to the mating surfaces of the sump cover and sump housing. Install the preformed packing in the groove of the sump cover.

(e) Apply Material No.C02-071 (primary) or C02-058 (alternative) to the sump housing stud threads.

WARNING : THE INSULATION BLANKET CAN CONTAIN CERAMIC FIBERS THAT CAN CAUSE IRRITATION TO YOUR SKIN, EYES, AND LUNGS. USE SKIN, EYE AND LUNG PROTECTION.

(f) Install the sump cover and insulation blanket to studs of the sump housing.

(g) Attach the sump cover and insulation blanket to the sump housing with eights nuts. TORQUE the nuts to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN).

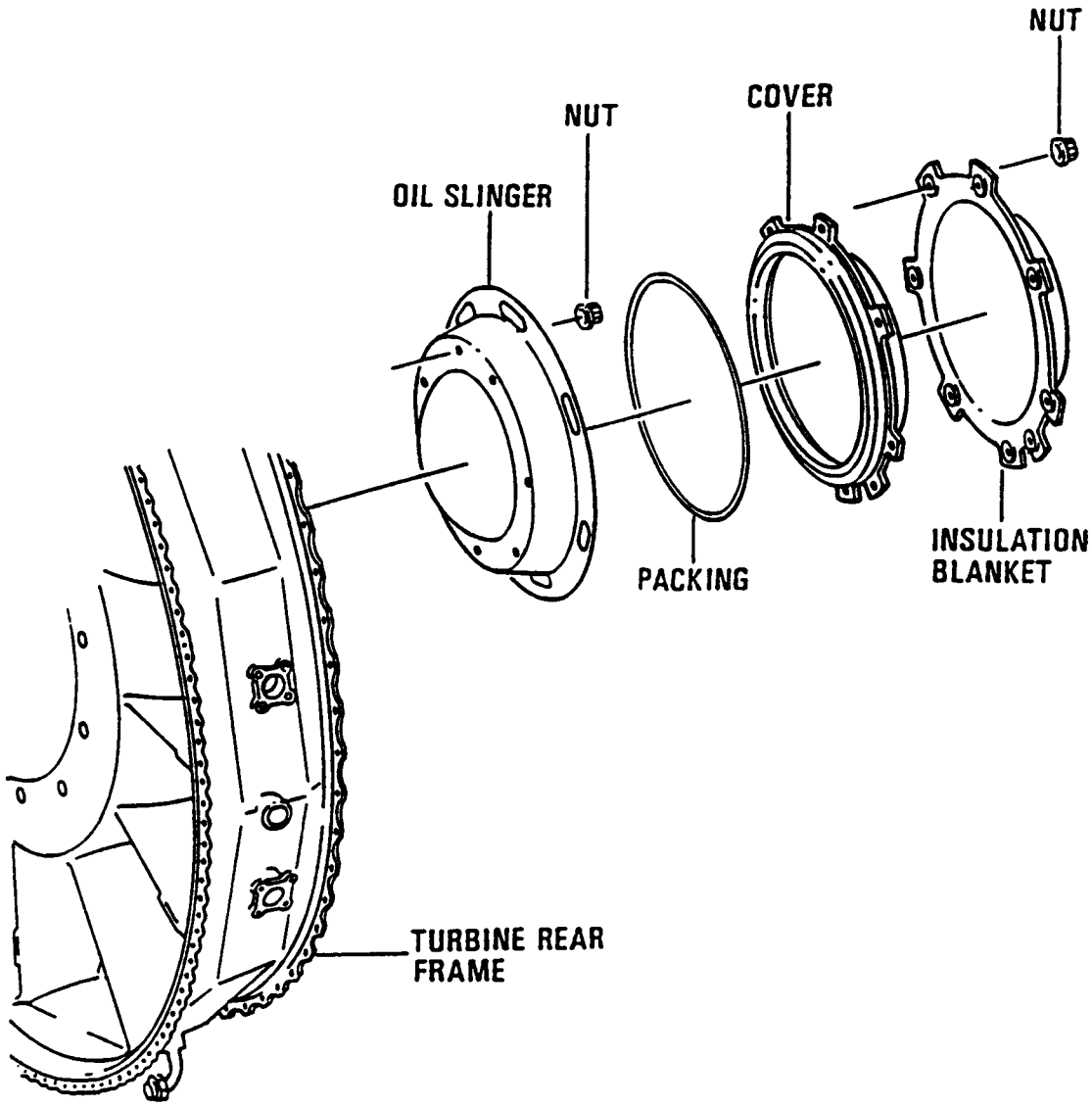
(7) Install the turbine exhaust plug (Ref. 78-11-02, P. Block 401).

(8) Remove the No. 1 bearing manifold (Ref. 72-21-01, P. Block 401).

(9) Visually inspect the No. 1 bearing manifold for an indication of distortion. Replace if damaged.

(10) Visually examine (with white light) the center vent tube for signs of buckling or distortion. Remove the engine if there is buckling or distortion (Ref. 71-00-00, P. Block 401).

(11) Install the No. 1 bearing manifold (Ref. 72-21-01, P. Block 401).



BM5 72 00 00 6 LCMO - 00

D-Sump Vent Inspection
Figure 606

N. If you identify fluid leakage from the fan rotor spinner as an oil/fuel mixture (contamination), you must remove the engine for shop level inspection (Ref. 71-00-00, P. Block 401).

O. Compressor Rear Frame (CRF) Oil Leak Inspection
(1)Remove the forward upper low pressure recoup tube at 8 o'clock strut as follows (Ref. Fig. 607) :
(a)Remove the bolts, nuts, gasket and clamps that attach the forward upper low pressure recoup tube to the CRF pad and HPT case forward flange bracket.
(b)Move the forward upper low pressure recoup tube forward from the aft upper low pressure recoup tube. Remove the forward tube.
(2)Through the strut opening for the forward upper low pressure recoup tube, use a flexible borescope to inspect Areas 1 through 5 for (Ref. Fig. 608) :
(a)Oil wetting/coke on the sump outer wall and tubes.
(b)Oil leakage from the oil supply tube and oil impingement manifold.
(c)Oil coke at the 12 o'clock strut.
(d)Oil leakage from oil supply tube and oil impingement manifold joints.
(3)If borescope inspection shows cracking, chafing, or oil leakage from the oil supply tube, replace the engine (Ref. 71-00-00, P. Block 401).
(4)If borescope inspection shows leakage from the oil impingement manifold, or oil coking on the upper half of the sump outer wall, replace the engine within 10 flight cycles (Ref. 71-00-00, P. Block 401).
(5)If borescope inspection shows leakage from tube joints, or the cause is the joint between the sump outer wall and CRF, and oil use is in limits, put the engine back into service while you monitor oil use.
(6)Install the forward upper low pressure recoup tube at the 8 o'clock strut as follows :
(a)Move the forward upper low pressure recoup tube on the aft upper low pressure recoup tube until the forward upper low pressure recoup tube bolt holes align with the bolt holes on the CRF pad and HPT case forward flange bracket.
(b)Install the forward upper low pressure recoup tube to the CRF pad with a gasket, four bolts and four nuts.
(c)Attach the forward upper low pressure recoup tube to the HPT case forward flange bracket with a clamp strap, two bolts, and two nuts.
(d)TORQUE the six nuts to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN).

P. Inlet Gearbox Assembly - Horizontal Bevel Gear Seal Borescope Inspection
(1)Remove the N1 fan shaft speed sensor at the 2:00 o'clock strut (Ref. 77-11-01, P. Block 401).
(a)Keep the shim pack with the sensor for installation after the inspection.
NOTE : It is not necessary to remove the N1 sensor guide tube to borescope the IGB horizontal bevel gear seal. If a tip larger than 0.2 inch (6 mm) is used, the guide tube may need to be backed out slightly to allow access to the IGB horizontal bevel gear seal.

(2)Insert a flexible borescope through the N1 sensor opening and position the borescope in the aft direction to view the IGB horizontal bevel gear seal (Ref. Fig. 609).
(3)Turn the N2 rotor using the manual crank procedure (Ref. 71-00-00, P. Block 501).
(4)Inspect the IGB horizontal bevel gear seal for the following conditions while turning the N2 rotor :
(a)Make sure the end of the seal is flush with the end of the gear (Ref. Fig. 610).
(b)Make sure the seal is not missing any pieces.
(c)Make sure that the seal covers the seal teeth completely. No part of the seal teeth should be visible (Ref. Fig. 611).
(d)Make sure there are no signs of cracking on the seal.
NOTE : A single radial split line in the seal of the bond joint in the seal is normal (this line may have a white or silver appearance).
(5)If the borescope inspection of the IGB horizontal bevel gear seal shows signs of cracking or missing pieces of the seal, if parts of the seal teeth are visible, or if a seal is extended beyond the end of the gear, replace the engine (Ref. 71-00-00, P. Block 401).
(6)Install the fan shaft speed sensor with new packings and the previously-removed shim pack for the correct spring height adjustment (Ref. 77-11-01, P. Block 401).
(7)Remove the equipment that was used to manually crank the N2 rotor (Ref. 71-00-00, P. Block 501).
(a)Install the cover plate with new packing.
(b)Perform an idle leak check (Ref. 71-00-00, P. Block 501).

Q. Inlet Gearbox Assembly (IGB) - Spline Nozzle Flow Check Borescope Inspection

Any engine that has operated with the No. 3 bearing oil supply nozzle (oil jet) blocked or partially blocked must have this borescope inspection to determine the amount of wear on the gear splines.
(1)Remove the N1 fan shaft speed sensor located at the 2:00 o'clock strut. (Ref. 77-11-01, P. Block 401).
(a)Keep the shim pack with the sensor for installation after the inspection.
(2)Put a flexible borescope in a position to observe the oil jet.
NOTE : A flexible borescope with a tip diameter of 0.2 in. (5.1 mm) is recommended for this inspection. A tip size larger than 0.2 in. (5.1 mm) will make it difficult to access the inspection area.
(a)Insert the flexible borescope through the N1 speed sensor guide tube, 2C6948P05, and turn the borescope aft to be in front on N1 speed sensor tip receptacle on the No. 2 bearing support (Ref. Fig. 612).
NOTE : The use of the N1 speed sensor guide tube is optional.
(b)Move the borescope aft through the IGB housing (Ref. Fig. 613) until the borescope tip reaches the No. 3 bearing oil supply manifold

located at the 12 o'clock position (Ref. Fig. 614)

(c)Adjust the borescope to get a clear view of the No. 3 bearing oil supply manifold nozzle.

(3)Install the oil dispenser, PF53361-2PWS, or equivalent, to pump the oil.

(a)Disconnect the oil supply tube form the A-sump oil inlet supply manifold located at the No. 9 fan frame strut and cap the open end of the tube (Ref. Fig. 615)

(b)If the oil dispenser has a pressure gauge, connect the delivery hose to the A-sump oil inlet supply manifold.

CAUTION : IF YOUR OIL DISPENSER DOES NOT HAVE A PRESSURE GAUGE, YOU MUST INSTALL A PRESSURE REGULATOR TO LIMIT THE PUMP OUTPUT TO 10-15 PSIG (68.9-103.4 KPA) OR DAMAGE MAY RESULT.

(c)If the oil dispenser is not equipped with pressure gauge, do the steps that follow :

1 Connect the oil dispenser to the pressure regulator and adjust the regulator output to be 10 to 15 psig (68.9 to 103.4 kPa), while you pump the dispenser.

2 Connect the regulator output to the A-sump oil inlet supply manifold.

(4)Do the borescope inspection procedure as follows :

CAUTION : DO NOT PUMP OIL AFTER YOU GET THE BORESCOPE INSPECTION RESULT. OTHERWISE, YOU CAN PUT TOO MUCH OIL INTO THE SYSTEM.

(a)Slowly hand-pump oil through the A-sump oil inlet supply manifold and into the No. 3 oil supply manifold. The oil pressure must be controlled to be 10 - 15 psig (68.9 to 103.4 kPa) and the total pumping time must not be less than 10 seconds.

(b)Observe the No. 3 bearing oil supply manifold by looking through the borescope to make sure there is a correct flow of oil.

1 Oil flowing from the nozzle should be a smooth and steady stream while you pump the oil. There should be no fantail, fine spray, or drops observed.

2 If the borescope inspection of the No. 3 bearing oil supply manifold shows blockage of IGB spline oil jet nozzle, do the Spline Backlash Inspection to determine IGB spline wear condition (Ref. 72-00-00, P. Block 601, Paragraph R.).

(c)Remove the borescope and disconnect the oil dispenser.

R. Inlet Gearbox Assembly (IGB) - Spline Backlash Check Borescope Inspection

(1)Get access to the N2 rotor manual crank pad located on the angle gearbox (AGB)(Ref. 71-00-00, P. Block 501).

(2)Remove the N1 fan shaft speed sensor located at the 2:00 o'clock strut. (Ref. 77-11-01, P. Block 401).

(a)Keep the shim pack with the sensor for installation after the inspection.

(3)Put a flexible borescope in a position to observe the oil jet.

NOTE : A flexible borescope with a tip diameter of 0.2 in.(5.1 mm) is recommended for this inspection. A tip size larger than 0.2 in.(5.1 mm) will make it difficult to access the inspection area.

(a)Insert the flexible borescope through N1 speed sensor guide tube, 2C6948P05, and turn the borescope aft to be in front on N1 speed sensor tip receptacle on the No. 2 bearing support (Ref. Fig. 612).

NOTE : The use of the N1 speed sensor guide tube is optional.

(b)Move the borescope aft through the IGB housing (Ref. Fig. 613) until the borescope reaches the No. 3 bearing oil supply manifold located at the 12 o'clock position (Ref. Fig. 614).

(c)Adjust the borescope to get a clear view of the tangs at the end of the stage 2 HPC Disk (Ref. Fig. 616)

(4)Do the borescope inspection procedure as follows :

(a)Choose two points, one on the IGB shaft and one on the end of the HPC stage 2 disk tang. Make sure the two points can be viewed with the borescope (Ref. Fig. 616).

(b)Slowly turn the N2 rotor using the manual crank procedure (Ref. 71-00-00, P. Block 501). Turn the manual crank in a clockwise direction to take up the backlash in the IGB shaft spline to the HPC stage 2 disk adapter. When the backlash has been taken up, stop rotating engine.

(c)Compare the arc distance between the two points for evidence that the shaft rotates without the HPC disk rotating less than 0.010 in. (0.254 mm), or approximately 2 degrees, while slowly rotating the engine with your hand using the manual cranking pad on the AGB in the counter-clockwise direction.

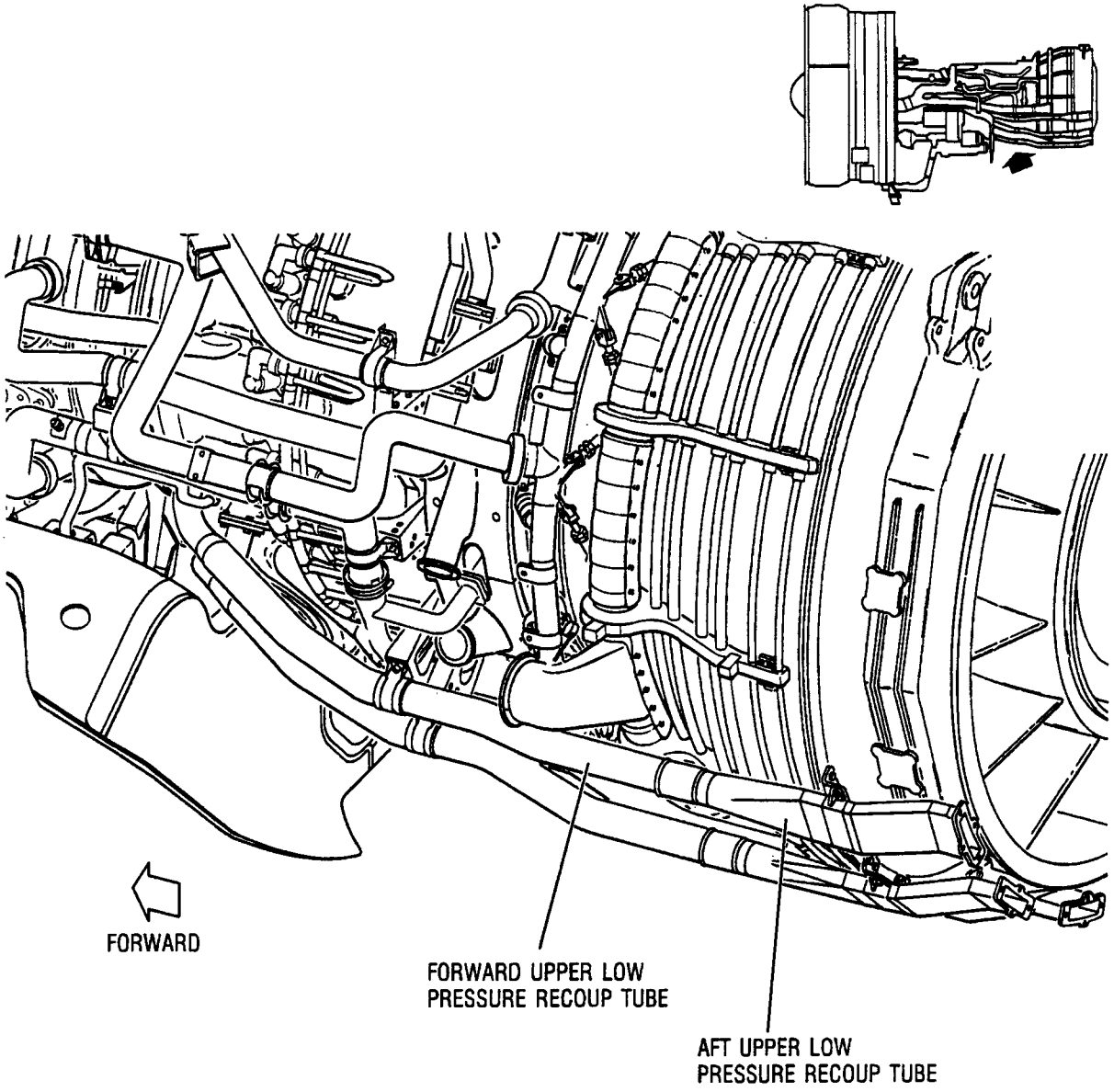
1 Limits would show no wear < 0.010 in. (0.254 mm).

2 Maximum serviceable limits is 0.060 in. (1.524 mm).

(d)Do steps (b) and (c) until the backlash measurement is complete.

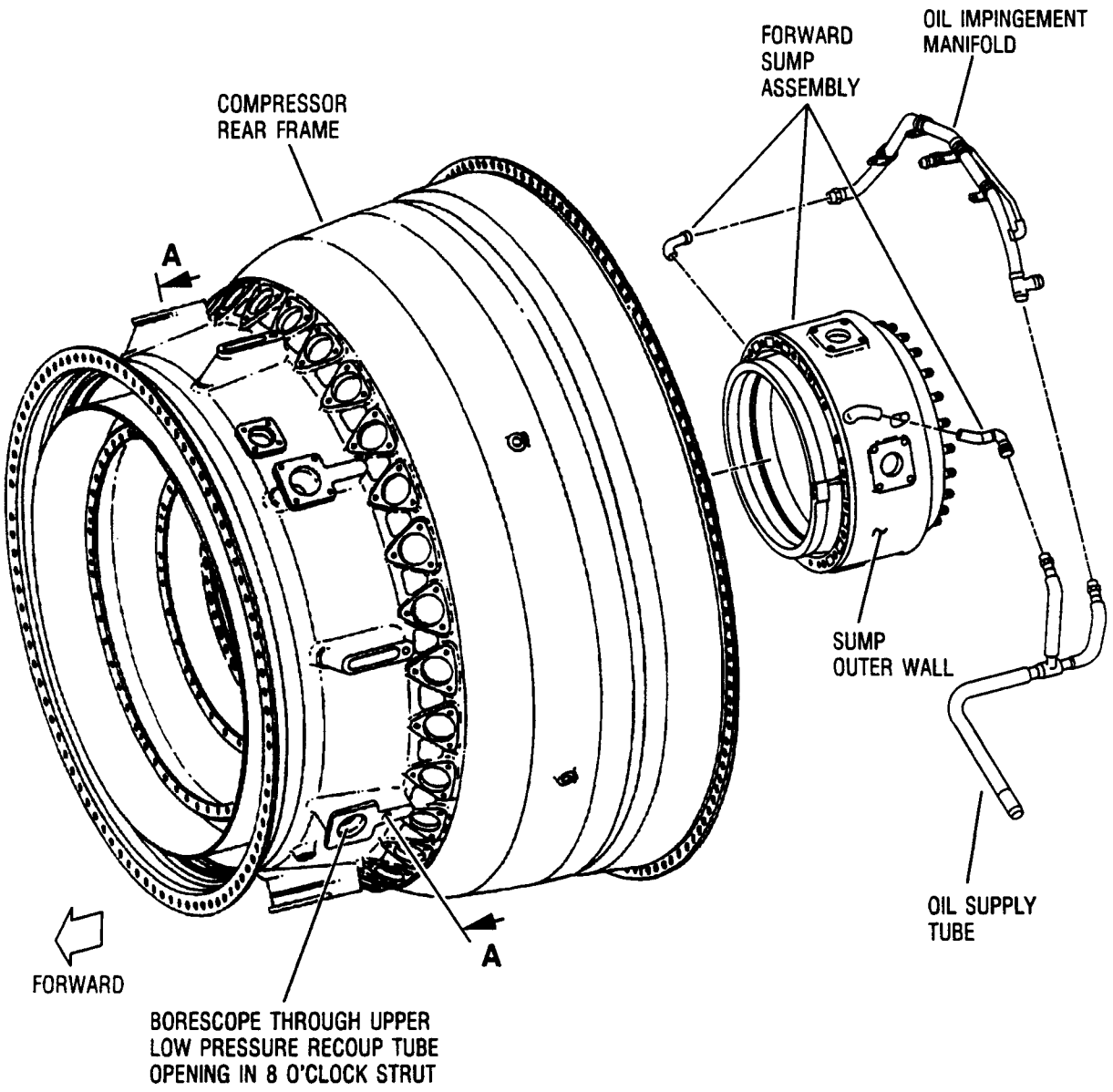
(e)If the backlash check exceeds the limits, remove the engine.

(f)Remove the borescope from the N1 Speed sensor port.



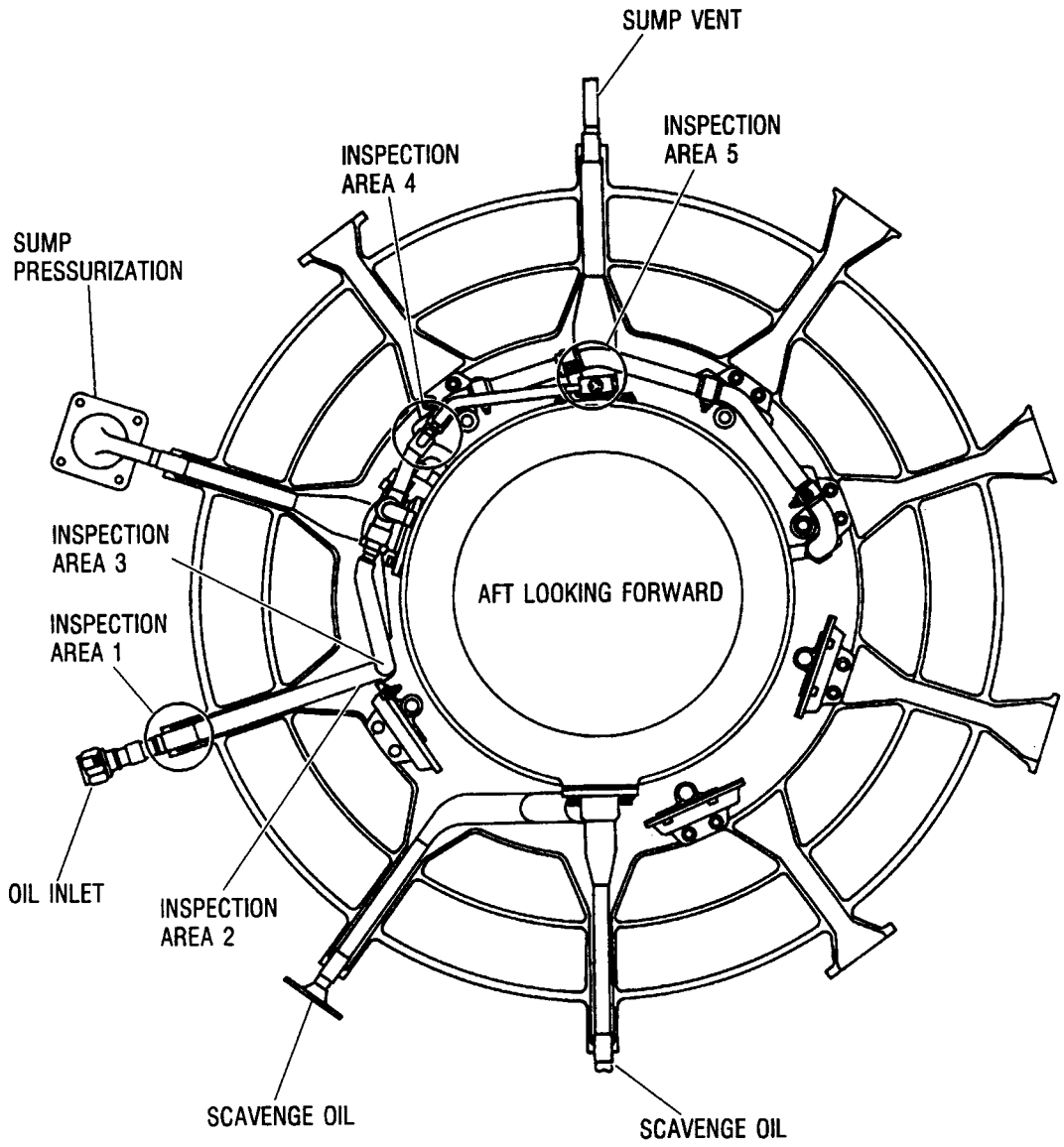
BM5 72 00 00 6 LJM0 00

Forward Upper Low Pressure Recoup Tube Removal
Figure 607



BM5 72 00 00 6 LKMA 00

Borescope Inspection for Oil Supply Tube and Oil Impigement Manifold (Sheet 1/2)
Figure 608

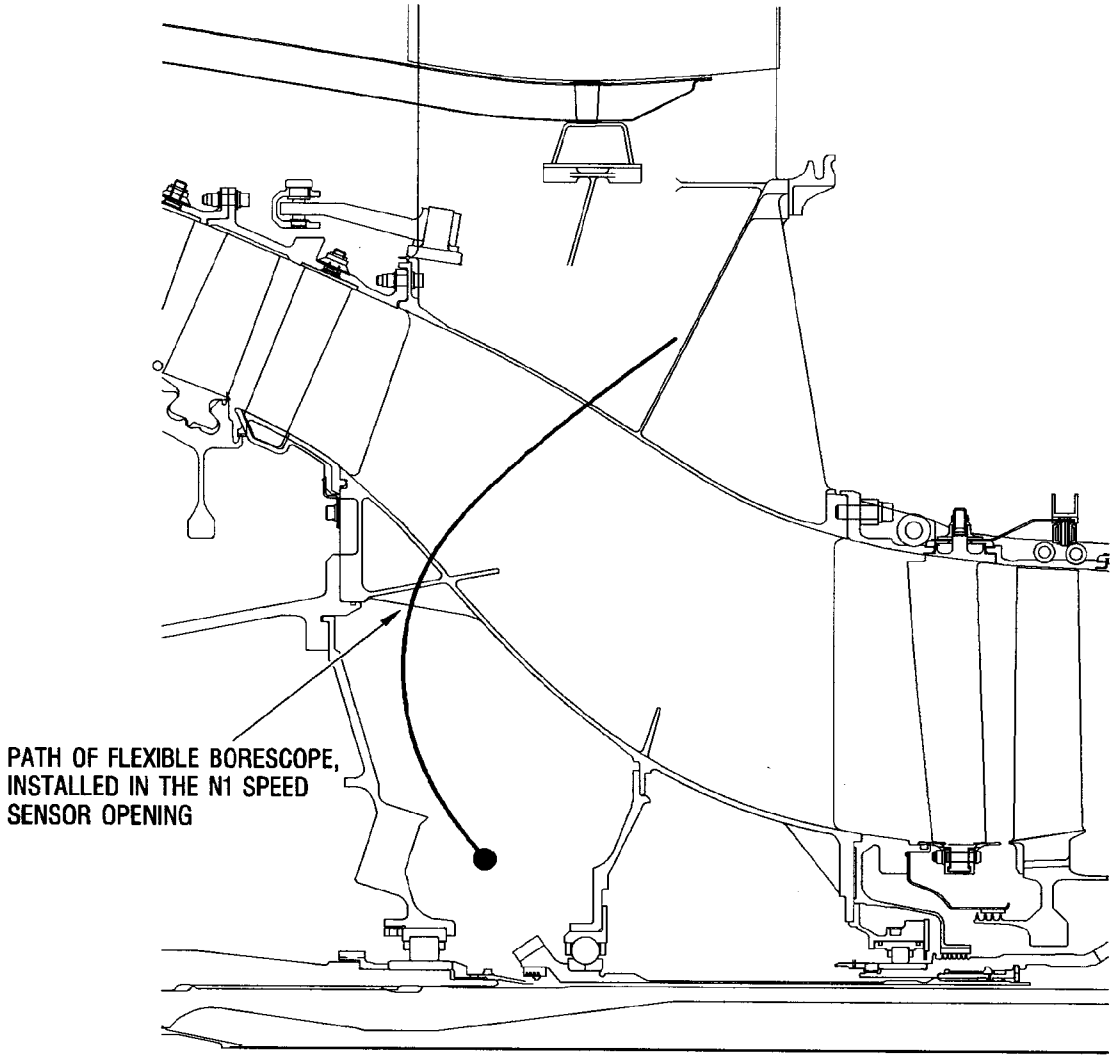


SECTION A-A

1160758-00-A

BM5 72 00 00 6 LKMJ 00

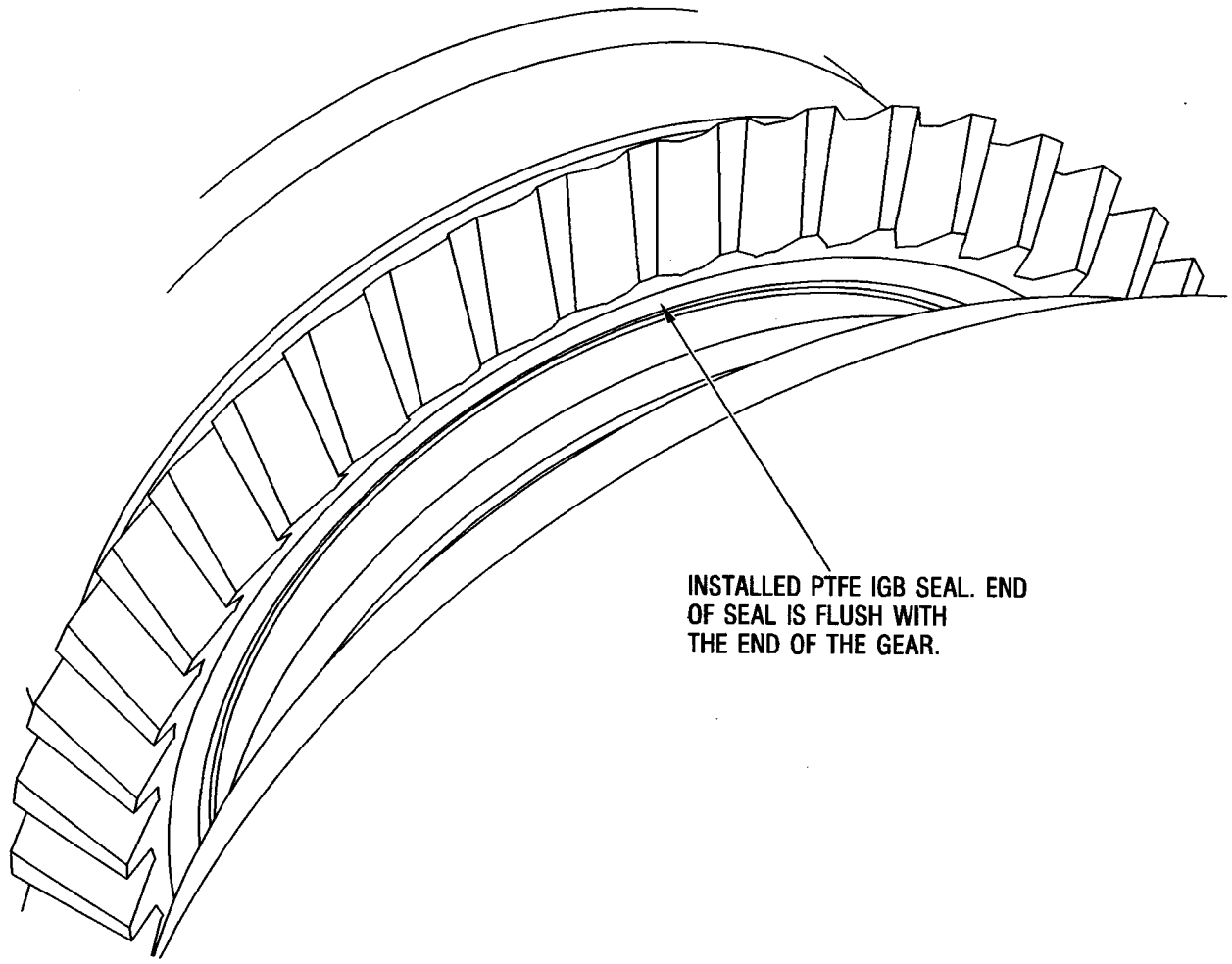
Borescope Inspection for Oil Supply Tube and Oil Impigement Manifold (Sheet 2/2)
Figure 608



1223406-00-A

BM5 72 00 00 6 LLM0 00

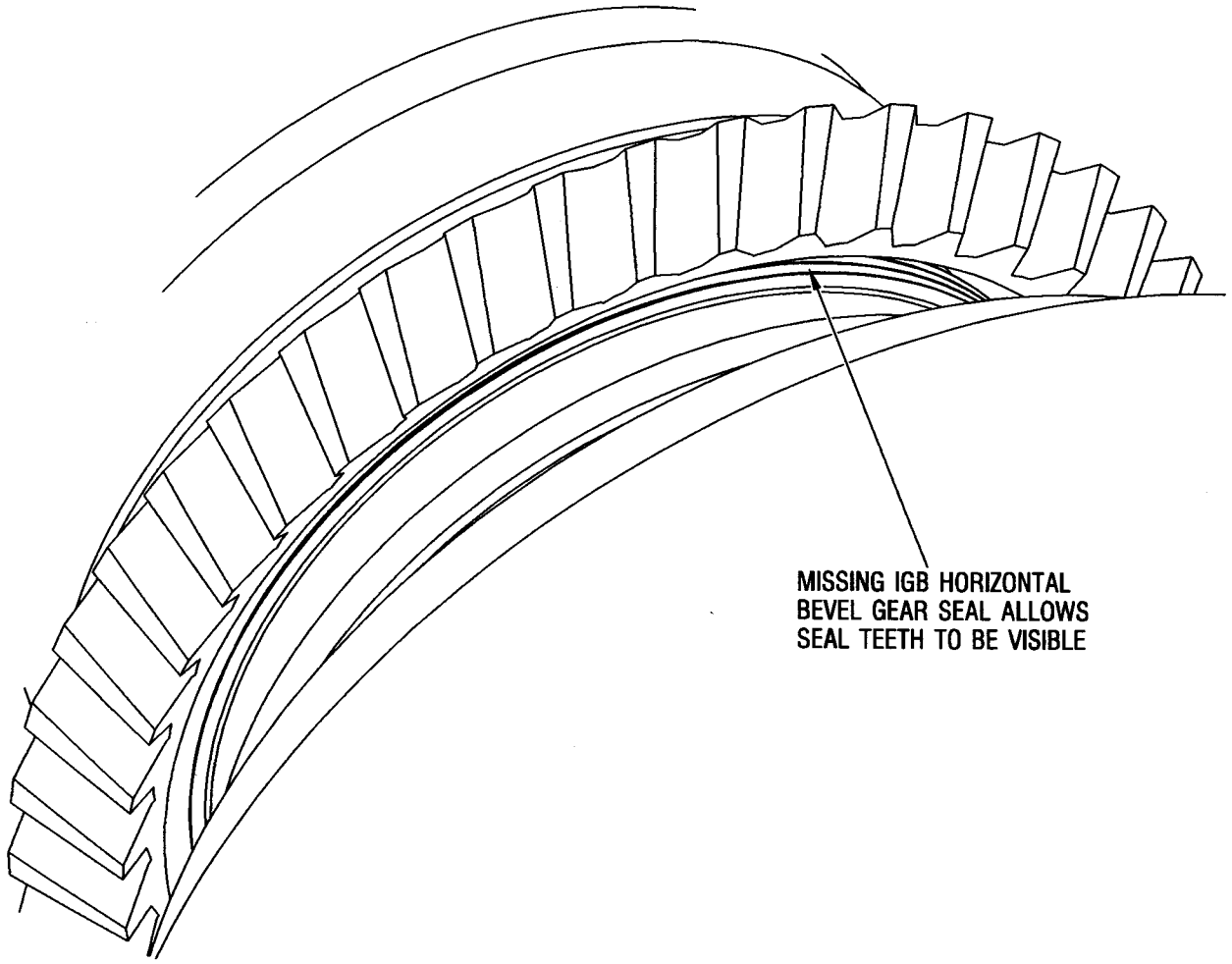
Flexible Borescope Inspection of the IGB Horizontal Bevel Gear Seal
Figure 609



1223407-00-A

BM5 72 00 00 6 LMM0 00

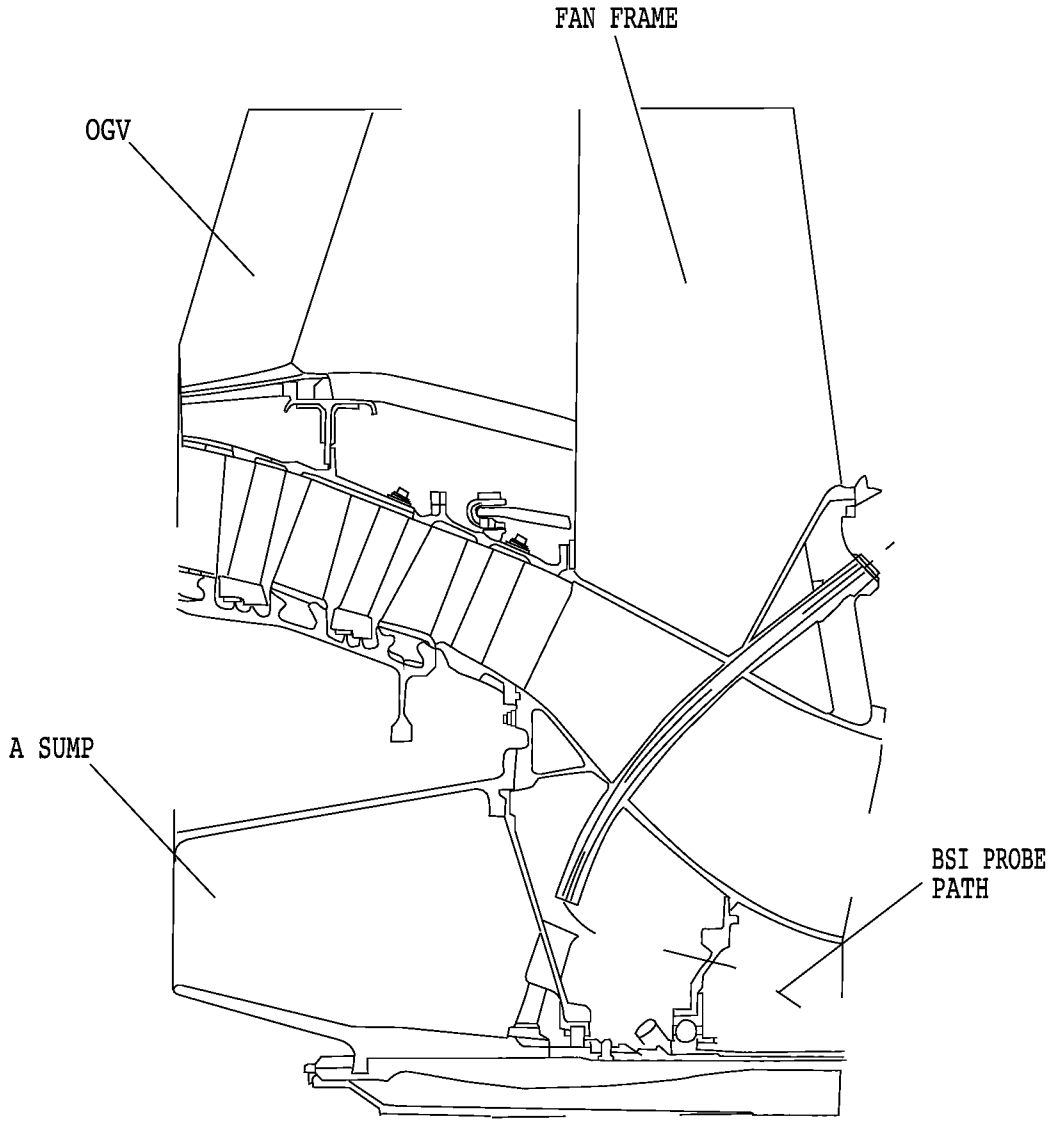
Correctly Installed IGB Bevel Gear Seal
Figure 610



1223408-00-A

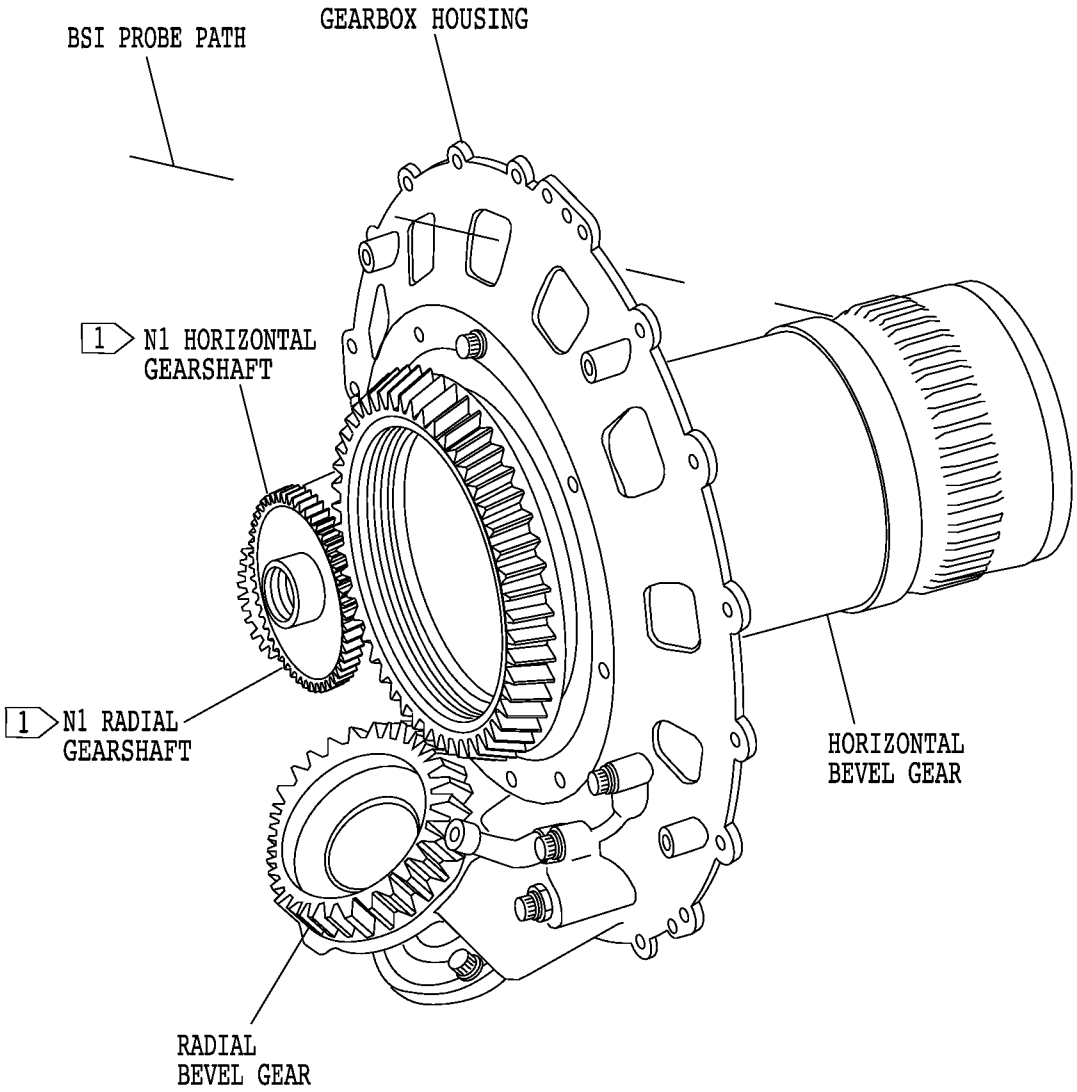
BM5 72 00 00 6 LNM0 00

Incorrectly Installed or Missing IGB Bevel Gear Seal
Figure 611



BM5 720000 6 LPM0 00

N1 Speed Sensor Tip Receptacle
Figure 612

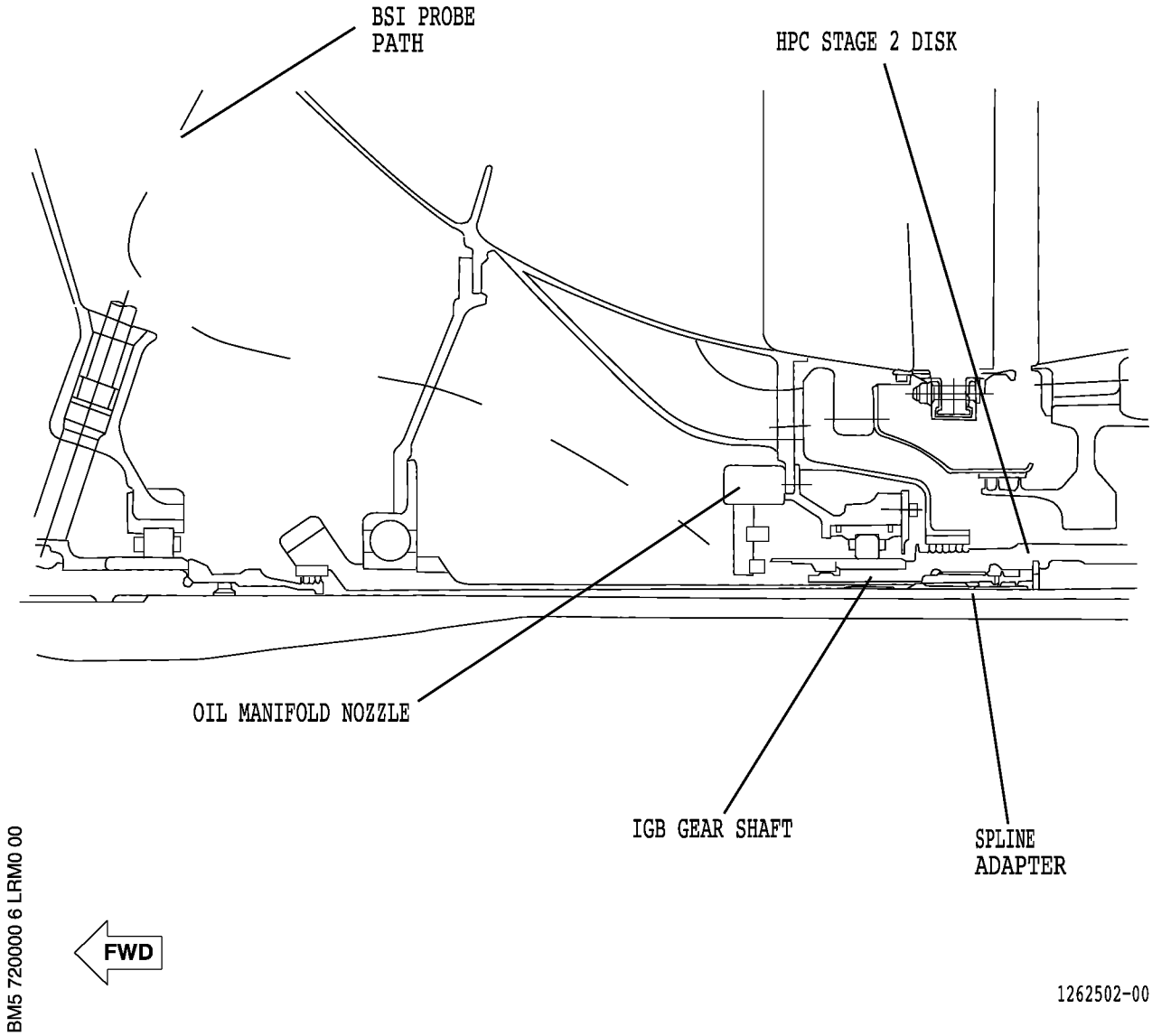


1 NOTE:
SB 72-395 REMOVED N1 GEARSHAFT PACKAGES

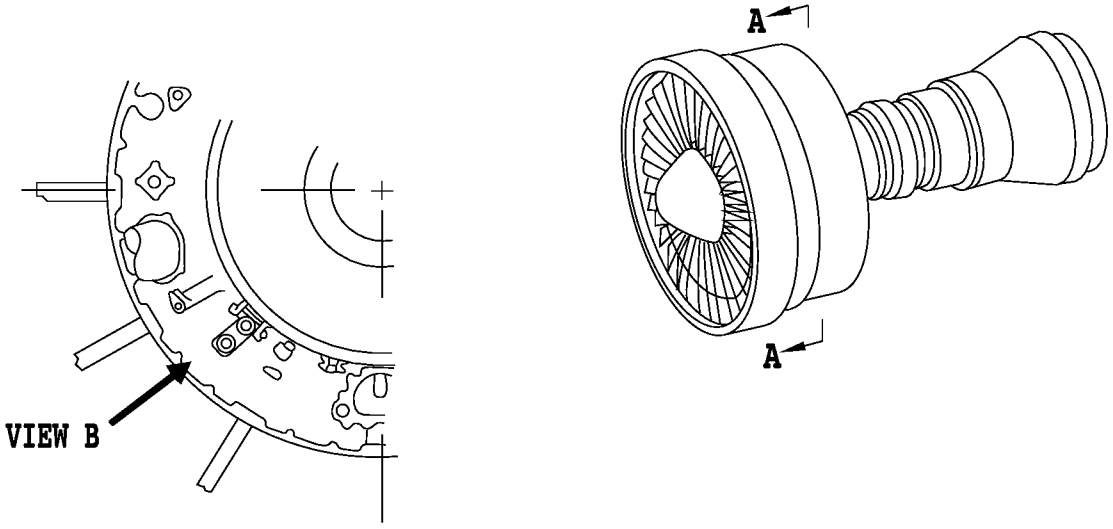
1262501-00

BM5 720000 6 LQM0 00

IGB Housing
Figure 613

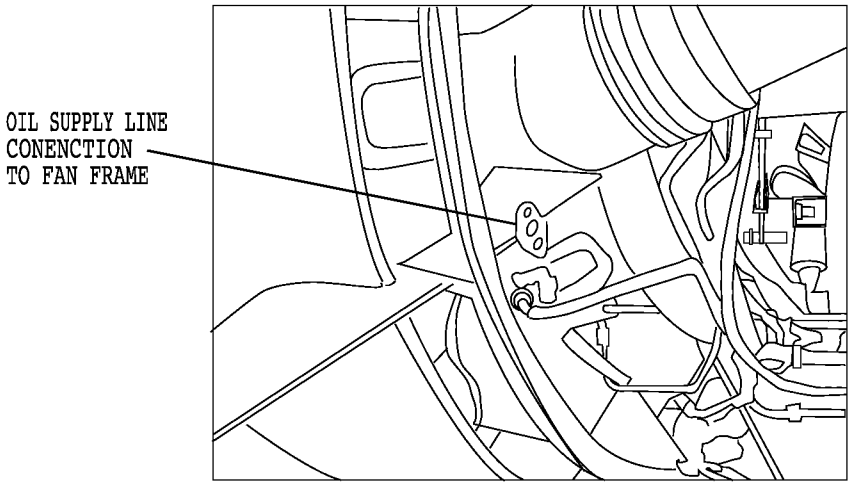


IGB BSI Routing
Figure 614



SECTION A-A

A-SUMP OIL SUPPLY TO FAN FRAME LOCATION
SHOWN WITH OIL SUPPLY LINE DISCONNECTED

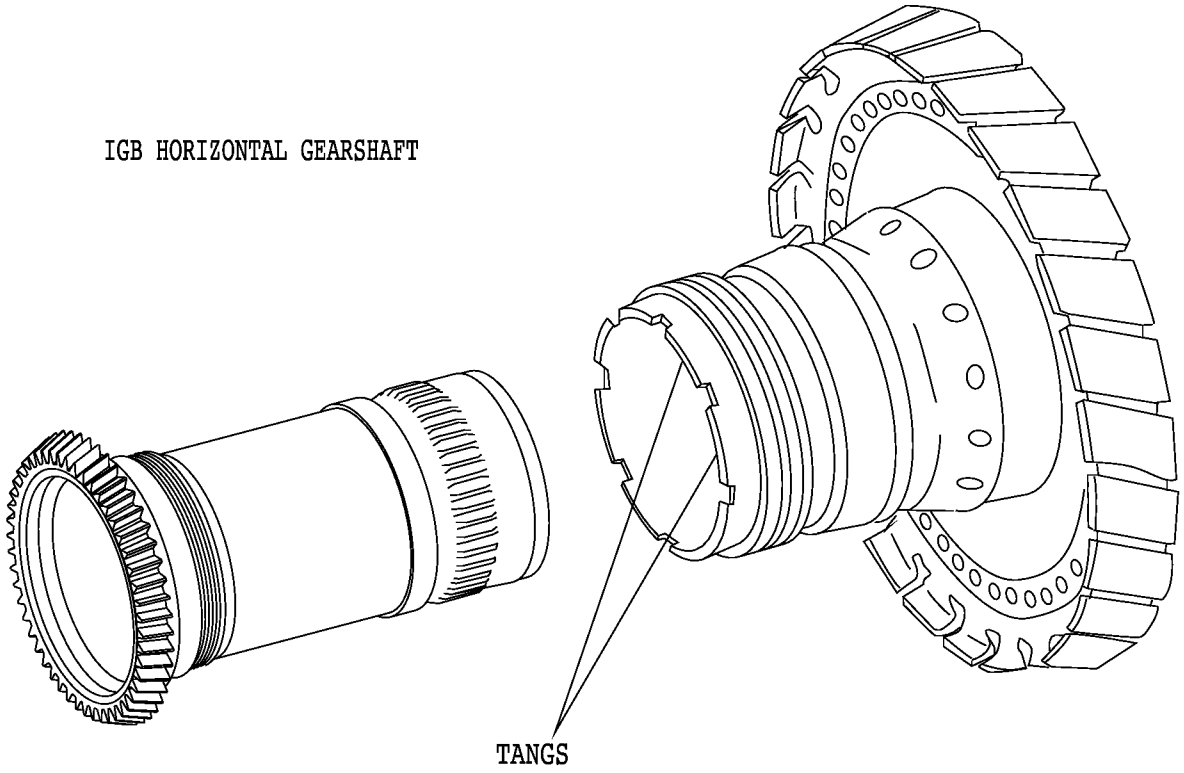


VIEW B

1274445-00-A

BM5 720000 6 LSM0 00

Inlet Gearbox Spline Nozzle Flow Check
Figure 615



BM5 720000 6 LTM0 00

1262504-00

HPC Stage 2 Tang Geometry
Figure 616

8. Engine Borescope Port Access (Ref. Fig. 617, 618)

A. Engine Preparation

CAUTION : DO NOT MAKE FIBERSCOPE INSPECTIONS WHERE PROBE IS EXPOSED TO TEMPERATURES GREATER THAN 150°F (65.6°C). ENGINE HIGH TEMPERATURES CAN DAMAGE THE FLEXIBLE GLASS RODS OF THE FIBER-OPTICS PROBE.

The engine is prepared for borescope inspection by removing borescope plugs or probes as required to gain access to the specified engine components.

NOTE : Open cowling checks as specified in paragraph 3.B. require borescope access for the combustor and HPT rotor only. Access to the compressor and LPT may be required due to specific operational conditions. The borescope access for the entire engine is listed below for reference.

NOTE : Removal torque should not exceed 2 1/2 times installation torque.

NOTE : If you cannot loosen and remove the referenced borescope plug, you can do the borescope inspection through an adjacent port.

(1)High Pressure Compressor (Core)
  (a)Stage 1 - B1-0 and B1-1.
  (b)Stage 7 - B1-6.
  (c)Stage 12 - B1-11.

(2)Combustor.
  Ports B2-1 through B2-5.

(3)Turbine Area.
  (a)HPT Rotor -B3-1 and B3-2.
  (b)LPT Inlet - B4-1 and EGT Probes (Ref. 77-21-04, P. Block 401).
  (c)LPT Rotor - B4-2, B4-3 and B4-4.

(4)The High Pressure Compressor (Core) can be rotated using Adapter, to ring - Core Engine Tool 2C14635G01 or Fixture, Motoring Core engine tool 2C14649P01, P02 or P03.

CAUTION : DO NOT EXCHANGE HPT PORT PLUG (B3-1) WITH HPT PORT PLUG (B3-2). THIS MISPLACEMENT WILL CAUSE INCREASED WEAR OF THE BORESCOPE PLUG ASSEMBLY AND INADEQUATE SEALING OF THE COOLING AND FLOWPATH AIR.

CAUTION : DO NOT EXCHANGE LPT PORT PLUGS (B4-3 THROUGH B4-4) WITH COMBUSTOR PLUGS (B2-1 THROUGH B2-5). COMBUSTOR LINER DAMAGE WILL RESULT IF LPT PORT PLUGS ARE INSTALLED IN COMBUSTOR PORTS. LPT CASING WILL OVERHEAT IF COMBUSTOR PORT PLUGS ARE INSTALLED IN LPT PORTS.

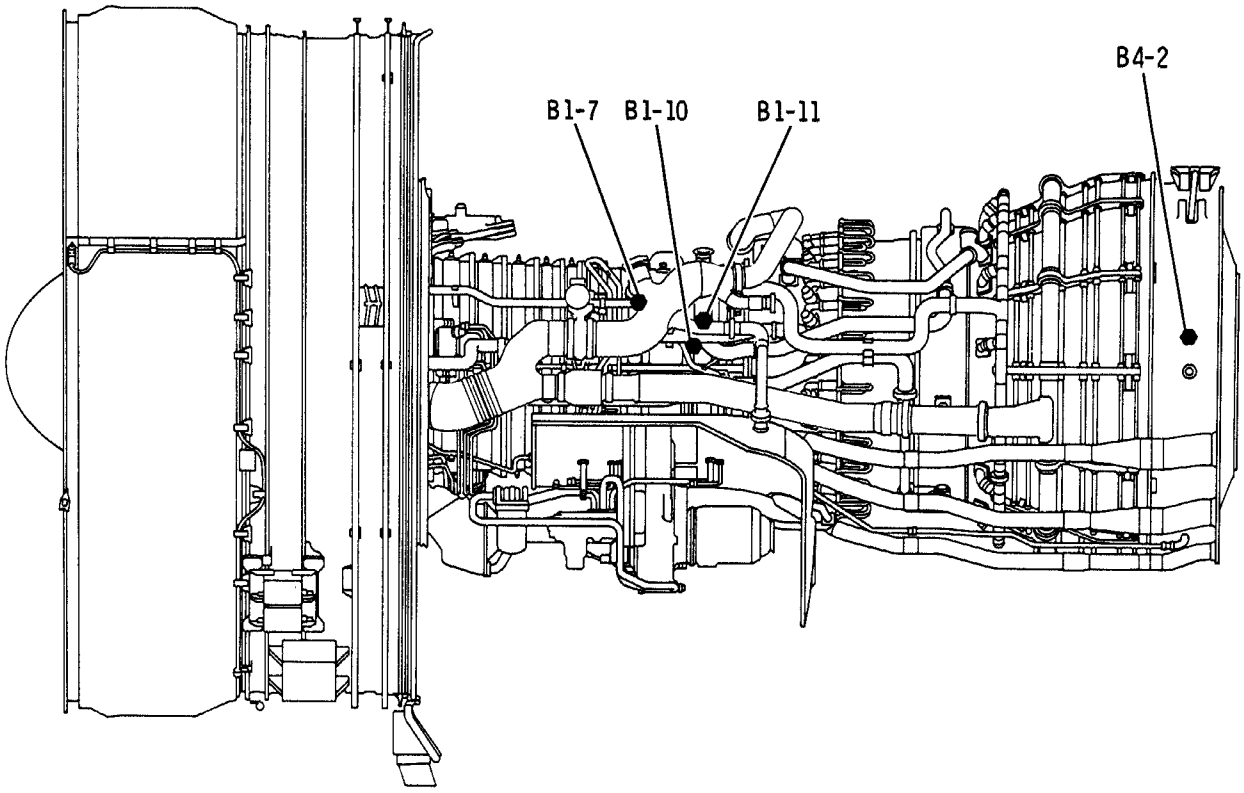
B. Borescope Plug and Installation

NOTE : Identify borescope plugs during removal for reinstallation in original location.

(1)Lightly coat plug threads and pressure faces with Material No.C02-071 (primary) or C02-058 (alternative).

NOTE : Coat the tip of plug B3-1 at interface to HPT nozzle.

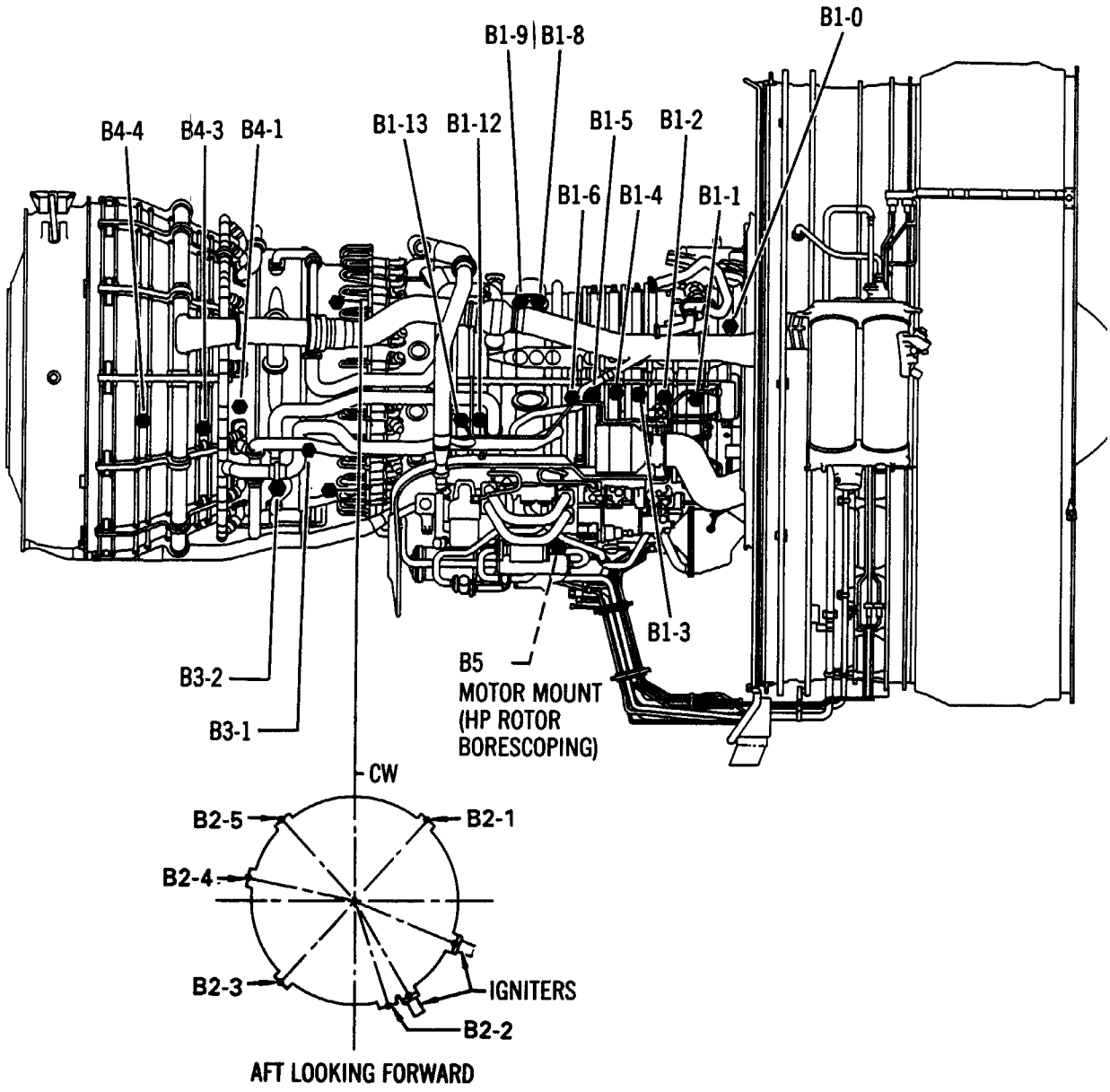
(2)Install and TORQUE plugs per the following :



CF8-6869-00-A

BM5 72 00 00 6 LBMO - 13 - 08
DM5

Borescope Ports - Left Side
Figure 617



Borescope Ports - Right Side
Figure 618

BORESCOPE PORT	WRENCH SIZE	INSTALLATION TORQUE lbf. in. (m.daN)
COMPRESSOR		
B1-0 through B1-6	3/16 Allen or 5/16 12-Pt.	33-37 (0.37-0.42) 40-60 (0.45-0.68)
B1-7 (No Plug)	Manifold Clamp nut	90-100 (1.02-1.13)
B1-8 (No Plug)	Manifold Clamp nut	90-100 (1.02-1.13)
B1-9	3/4 hex. Manifold clamp nut	40-60 (0.45-0.68) 90-100 (1.02-1.13)
B1-11 (No plug)	Manifold clamp nut	43-48 (0.49-0.54)
B1-10 and B1-13	3/4 hex.	40-60 (0.45-0.68)
B1-12	3/4 hex.	40-60 (0.45-0.68)
COMBUSTOR		
B2-1 through B2-5	7/8 hex.	140-160 (1.58-1.81)
High Pressure Turbine (HPT)		
B3-1	1-1/8 hex.	50-60 (0.57-0.68)
B3-2	1-1/8 hex.	50-60 (0.57-0.68)
Low Pressure Turbine (LPT)		
B4-3 and B4-4	7/8 hex.	140-160 (1.58-1.81)
B4-2 (Pad Cover bolts)	5/16 12-Pt.	55-70 (0.62-0.79)
B4-1 (Pad Cover/ Probe bolts)	5/16 12-Pt.	55-70 (0.62-0.79)
EGT Probes (Ref. 77-21-04, P. Block 401)		

1. General

This page block contains cleaning procedures to wash fan inlet and exit areas, to use hydrocarbon and steam methods of cleaning specific areas, and to remove hydraulic fluid spills, fire extinguishing agents and deposits from core engine airfoils. The engine does not require scheduled intervals for cleaning. However, periodically, cleaning must be performed to remove accumulated contamination from the fan and compressor section blades and vanes.

NOTE : Paint procedures are not included in this page block.

2. Equipment and Materials

	ITEM	DESIGNATION
	A.	Steam cleaner and tools
	B.	Vacuum tools
	C. 2C8043	Cleaning Kit - Coke
	D.	Compressed Air Source Capable of Supplying Dry Air, 240 cfm (0.1179 m3/s) at 80 psig (551 kPa)
	E.	Safetybelt and tether with 500 pounds (227 kg) Working Strength
	F.	Safety Eye Goggles and Protective Ear Gear
	G.	Protective Mats - (3 required), Rubber Manufacturers Association Grade SC43, Neoprene Sponge, 1 - in. Thick, Apprx 3X4 with Warning Streamers Attached
	H.	Juniper Water Wash Cart (or equivalent) - JMP/CF6/D/4038/C200 Cart Water Wash Rig (vendor code U2066). Juniper A T/Liverpool/Ltd. 4 Mapledale Road, Liverpool L18 5JE United Kingdom.
R	J.	Twin hose assembly Juniper, JMP/CF6/A/4087
R	K.	CF6 water wash short spray lances (vendor code U2066) Juniper.
R	L. Material No.C04-001	Cleaning Compounds and Solvents (Ref. 70-00-00)
R	M. Material No.C04-002	Cleaning Compounds and Solvents (Ref. 70-00-00)
R	N. Material No.C04-026	Cleaning Compounds and Solvents (Ref. 70-00-00)
R	P. Material No.C04-035	Cleaning Compounds and Solvents (Ref. 70-00-00)
R	Q. Material No.C04-140	Cleaning Compounds and Solvents (Ref. 70-00-00)
R	R. Material No.C04-151	Cleaning Compounds and Solvents (Ref. 70-00-00)
R	S. Material No.C10-010	Miscellaneous (Ref. 70-00-00)

ITEM		DESIGNATION
R	T. Material No.C10-012	Miscellaneous (Ref. 70-00-00)
	Referenced Procedures	
	- 71-00-00, P. Block 501	Power Plant - General
	- 71-13-00, P. Block 301	Cowl Doors

3. Engine Wash

WARNING : CLEANING SOLVENTS ARE HIGHLY FLAMMABLE, VOLATILE, AND TOXIC. THEY SHOULD BE USED WITH ADEQUATE VENTILATION. AVOID PROLONGED BREATHING OF VAPORS AND REPEATED OR PROLONGED CONTACT WITH THE SKIN.

CAUTION : CLEANING AGENTS SHALL BE ESSENTIALLY FREE OF SODIUM AND SULPHUR TO PROTECT THE NICKEL BASED ALLOYS IN HOT SECTION COMPONENTS FROM HOT CORROSION. DO NOT USE ANY SOLUTION THAT CONTAINS CHLORINE, FLUORINE, BROMINE, IODINE OR ANY OF THEIR COMPOUNDS FOR CLEANING OR FOR ANY OTHER PURPOSE ON TITANIUM PARTS. USE OF THESE MATERIALS MAY RESULT IN STRESS CORROSION/CRACKING OF TITANIUM.

A. Fan Blade Wash Procedure

This procedure provides instructions for cleaning of the fan inlet and exhaust areas by hand spraying with a recommended cleaning solvent and, also provides instructions for removing light deposits from the fan blades. This cleaning will be accomplished with the engine shutdown.

(1) If cleaning of engine inlet area is to be done, place protective mats over lower half of nose cowl interior. Wash fan inlet and exhaust areas by hand spraying using a cleaning solution.

(2) Made with 20 percent by volume of detergent cleaner (C04-140) or equivalent and water at room temperature. Water used in cleaning solution and rinsing shall be clean and unchlorinated.

(3) Remove light deposits from fan blades by hand using a soft cloth wetted with Methyl-Ethyl-Ketone (MEK), (C04-001). Stubborn or heavier deposits may be removed using MEK with an abrasive pad (C10-010).

B. Gas Path (Core) Wash Procedure Using the Juniper Wash Equipment (or equivalent) (Alternate Procedure)

NOTE : This procedure gives the instructions to do a gas path procedure using the Juniper wash equipment, or equivalent equipment.

R NOTE : You can do an alternative water wash procedure. Each provider
R must compare their procedure against the manual water wash
R specifications/criteria.

CAUTION : DO NOT USE THIS TASK TO CLEAN DRY CHEMICAL FIRE EXTINGUISHER PARTICLES FROM THE ENGINE. USE THE TASK "REMOVAL OF FIRE EXTINGUISHING AGENTS-EXTERNAL" TO CLEAN DRY CHEMICAL FIRE EXTINGUISHER PARTICLES FROM THE ENGINE. DANGEROUS CORROSIVE COMPOUNDS ARE FORMED WHEN THESE PARTICLES ARE MIXED WITH WATER.

CAUTION : DO NOT WATER WASH ENGINE UNLESS EGT INDICATION IS BELOW 200°F (93°C). STRESS TO THE ENGINE COMPONENTS CAN OCCUR BY A FAST TEMPERATURE CHANGE.

CAUTION : DO NOT OPERATE THE STARTER MORE THAN ITS DUTY CYCLE PERMITS. DAMAGE TO THE STARTER CAN OCCUR.

CAUTION : FLUORIDE AND CHLORIDE COMPOUNDS HAVE BEEN FOUND TO REACT WITH THE METAL IN THE FAN MIDSHAFT CAUSING MICRO-CRACKING. WATER USED FOR WATER WASH SHOULD BE TESTED FOR FLUORIDES AND CHLORIDES AND THE LIMITS FOR THESE ELEMENTS SHOULD NOT BE EXCEEDED.

(1)Engine water wash recommendations.

(a)Observe all safety precautions.

(b)Use wash water with no chemicals added. Make sure the water meets the following criteria :

- Total dissolved solids - 500 ppm or less
- Chlorides - 250 ppm or less
- Fluoride - 2 ppm or less
- Sodium - 20 ppm or less
- Sulfate - 250 ppm or less
- pH - 6.4 to 8.5

NOTE : Potable water usually meets these requirements but must be tested periodically.

WARNING : PRECAUTIONS FOR FLAMMABLE AGENTS MUST BE OBEYED WHEN YOU USE ANTIFREEZE SOLUTIONS WITH LOW FLASH POINTS. A FIRE CAN OCCUR IF YOU USE THE ANTIFREEZE INCORRECTLY.

WARNING : DO NOT MIX ALCOHOL IN THE ANTIFREEZE SOLUTION IF YOU USE IMMERSION HEATER. INJURIES TO PERSONNEL, AND DAMAGE TO EQUIPMENT CAN OCCUR.

(c)Use wash water with antifreeze if the air temperature is below 40°F (5°C).

(d)For optimum results, heat wash water to 150°-175°F (65°-80°C). Hot water is more effective than cold water, either for cleaning or rinsing. During application of wash/rinse water, the flow rate should be 10-15 US gallons per minute (38-57 liters per minute).

(2)Prepare engine for water wash as follows :

(a)Open, safety and tag circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

(b)Cut and remove lockwire, disconnect CDP line to the main engine control (MEC) at the compressor rear frame (CRF) (Ref. Fig. 702).

(c)Plug CDP line with metal caps or plugs to prevent air and water from flowing through the line.

(d)Open VSV's and close VBV's as follows :

NOTE : VSV's and VBV's will not open and close respectively until engine motoring begins.

1 Disconnect VBV feedback cable from MEC feedback lever by removing cotter pin, washers, nut and bolt.

2 Disconnect VSV feedback cable from MEC feedback lever by removing cotter pin, washers, nut and bolt.

3 Move VSV feedback lever on MEC to full travel in the direction of the VSV trimmer bracket (direction that will close VBV's) and restrain lever at full travel with lockwire (Ref. Fig. 701).

4 Move VBV feedback lever on MEC to full travel in the direction of the VBV trimmer bracket (direction that will open VSV's) and restrain lever at full travel with lockwire (Ref. Fig. 701).

5 Remove safety clips and tags and close circuit breakers, close core cowl and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

(e)Set the following controls.

1 On panel 426VU
- release ENG 1(2) ANTI-ICE pushbutton switch.

2 On panel 436VU
- release ENG 1(2) BLEED VALVE pushbutton switch.

CAUTION : DO NOT MOTOR THE ENGINE UNLESS THERE IS A CORRECT FUEL INLET PRESSURE. THE MAIN FUEL PUMP AND THE MAIN ENGINE CONTROL ARE LUBRICATED BY FUEL. IF YOU MOTOR THE ENGINE WITHOUT CORRECT FUEL INLET PRESSURE, DAMAGE TO THE MAIN FUEL PUMP AND THE MAIN ENGINE CONTROL CAN OCCUR.

(3)Prepare the engine to be dry motored (Ref. 71-00-00, P. Block 501).

(4)Prepare the water rig. Use a Juniper rig or equivalent.

WARNING : THE WATER WASH RIG MUST BE DISCONNECTED FROM ELECTRICAL POWER SUPPLY DURING INSTALLATION TO THE ENGINE AND DURING THE WASH PROCEDURE. OTHERWISE, INJURY TO PERSONNEL CAN OCCUR.

NOTE : If you use a Juniper rig, make sure the nitrogen cylinders are fully charged. If the nitrogen cylinders are not fully charged, you will not be able to maintain the correct flow rates for the necessary length of time.

(a)Check the fluid flow rate of the Juniper cart. Check before you connect to the engine.

1 Add 2.6 US gallons of water to the rinse tank and let it flow for 15 seconds.

2 Find the suitable tank pressure for the correct flow from the rinse tank. Use that same pressure for the wash tank.

3 Observe the flow rates of the two probes, when added together, have a total flow rate of 10-15 US gallons per minute.

NOTE : The Juniper cart's sight glass and a stopwatch can be used to measure and make sure the flow rate is within the approved limit.

(b)Install the short spray lances as follows :

1 Insert the short spray lances from the aft side of the fan case and between the outlet guide vanes (OGV's) at the 4 o'clock and 8 o'clock positions. Secure the lances using the clamp device provided (Ref. Fig. 703).

NOTE : In front, the spray lances will only be held in place by the fan splitter while the end of the spray lances should be between the inlet guide vanes (IGV) of the low pressure compressor (LPC).

2 Connect the double hose connection to the spray lances and the applicable hose on the water wash rig. Make sure that the spray lances are connected to the hoses correctly.

3 Make sure the probes are safely held in place.

4 Rotate the fan rotor by hand to verify the rotor is free to turn.

5 Install the fluid delivery manifold using a strap to the engine at the 6:00 o'clock position.

(5)Prepare the water solution.

WARNING : PRECAUTIONS FOR FLAMMABLE AGENTS MUST BE OBEYED WHEN YOU USE ANTIFREEZE SOLUTIONS WITH LOW FLASH POINTS. A FIRE CAN OCCUR

IF YOU USE THE ANTIFREEZE INCORRECTLY.

WARNING : DO NOT MIX ALCOHOL IN THE ANTIFREEZE SOLUTION IF YOU USE AN IMMERSION HEATER. INJURIES TO PERSONNEL AND DAMAGE TO EQUIPMENT CAN OCCUR.

WARNING : ISOPROPYL ALCOHOL IS AN AGENT THAT IS FLAMMABLE, EXPLOSIVE, POISONOUS, AND AN IRRITANT. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN ISOPROPYL ALCOHOL IS USED.

- GAS/AIR MIXTURES MORE THAN THE LOWER EXPLOSIVE LIMIT (LEL) CAN CAUSE AN EXPLOSION IF HIGH HEAT, SPARKS, OR FLAMES SUPPLY IGNITION.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET ISOPROPYL ALCOHOL IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE VAPORS.

CAUTION : DO NOT ADD CHEMICALS TO THE WATER, OR DAMAGE TO THE ENGINE MAY OCCUR.

(a)If the ambient air temperature is below 40°F (5°C), add the anti-freeze to the water. Add the antifreeze as follows :

1 If the ambient air temperature is 40°F (5°C) to 23°F (-5°C), mix 25% isopropryl alcohol (Material No. C04-035) to 75% water.

2 If the ambient air temperature is 23°F (-5°C) to 14°F (-10°C), mix 35% isopropryl alcohol (Material No. C04-035) to 65% water.

3 For best results, increase the temperature of the water to 150°-175°F- (66°-79°C).

NOTE : Hot water is better than cold water to clean or to flush the engine gas path.

(6)Water wash the engine as follows :

CAUTION : DO NOT CLEAN THE ENGINE UNLESS THE EGT INDICATION IS BELLOW 200°F (93°C). STRESS TO THE ENGINE COMPONENTS CAN OCCUR BY A FAST TEMPERATURE CHANGE. DO NOT OPERATE THE STARTER MORE THAN ITS DUTY CYCLE PERMITS. DAMAGE TO THE STARTER CAN OCCUR.

(a)If you use a detergent mixture, do these steps to water wash the engine :

1 Mix 20 gallons (75.7 liters) of the detergent mixture as follows :
- 80% water = 16 gallons (60.6 liters)
- 20% detergent gas path cleaner (Material No. C04-140) = four gallons (15.1 liters)

NOTE : Rubber gloves must be worn when you use the detergent mixture.

2 Dry motor the engine for 90 seconds (Ref. 71-00-00, P. Block 501). Make sure you are prepared to apply the detergent mixture into the LPC inlet.

3 Release the starter switch.

4 Immediately apply the detergent mixture until the mixture is fully used or until the fan rotor (N1) fully stops rotation.

5 Use a flow rate of 10-11 gallons per minute (38-57 liters per minute).

6 If a hand held cleaning wand is used, the wand should be approximately 5 to 10 feet from the engine inlet.

7 Let the engine soak for 10 minutes. After ten minutes flush the engine with water. Refer to step (b) below.

CAUTION : YOU MUST USE A FLOW RATE OF 10-15 GALLONS (38-57 LITERS) PER MINUTE OR YOU CAN DAMAGE THE COMPRESSOR.

(b)If you use water only do theses steps to water wash the engine :

NOTE : The fan rotor (N1) must turn freely during this procedure.

1 If you are using the Juniper spray lances (or equivalent), and you are injecting water directly into the booster, do these steps :
- Dry motor the engine for two minutes while you inject water into the LPC inlet (Ref. 71-00-00, P. Block 501).
- If a hand held cleaning wand is used, the wand should be approximately 5 to 10 feet from the engine inlet. The water should be injected into the LPC inlet.
- Let the engine soak for ten minutes.
- Dry motor the engine for three minutes as follows : (Ref. 71-00-00, P. Block 501).
  . Apply water for the first two minutes.
  . Dry motor for the third minute.

(c)If you are using a hand held cleaning wand, and you are not injecting water directly into the booster, do these steps :

NOTE : If a hand held cleaning wand is used, the wand should be 5 to 10 feet from the engine inlet at about the 1 o'clock position. The water should be injected towards the LPC inlet.

NOTE : The fan rotor (N1) must turn freely during this procedure.

1 Dry motor the engine for three minutes while you do these steps (Ref. 71-00-00, P. Block 501).
- Apply water for the first two minutes.
- Dry motor the engine for a third minute.

2 Let the engine soak for ten minutes.

3 Motor the engine for six minutes as follows :
- Apply water for first two minutes.
- Dry motor the engine for one minute.
- Apply water for two minutes.
- Dry motor the engine for one minute.

4 Let the engine drain for five minutes.

(7)Disconnect the water wash rig.

(a)Disconnect the double hose connection to the spray lances and the relevant hose of the Juniper rig (or equivalent equipment).

(b)Remove the spray lances.

CAUTION : DO THESE STEPS TO PUT THE ENGINE BACK TO ITS USUAL CONDITION IMMEDIATELY. DAMAGE TO THE ENGINE CAN OCCUR IF YOU DO NOT DO THESE STEPS IMMEDIATELY.

(8)Prepare engine for service as follows :

(a)Open, safety and tag the circuit breakers for the appropriate engine and open fan cowl, thrust reverser and core cowl doors (Ref. 71-13-00, P. Block 301) and allow the engine to drain for five minutes.

CAUTION : THE CDP LINE MUST BE CORRECTLY INSTALLED AND TORQUED. ENGINE OPERATION WILL BE AFFECTED IF THE CDP LINE IS NOT INSTALLED AND TORQUED CORRECTLY.

(b)Connect the CDP line B-nut to the fitting on the compressor rear frame. TORQUE the CDP line B-nut to between 270 and 300 lbf.in. (3.05 and 3.39 m.daN) and wirelock.

(c)Cut and remove lockwire restraining both VSV and VBV feedback levers

and connect VSV and VBV feedback cables to their respective feedback levers and secure each with bolt, washer and nut. TORQUE nut to between 20 and 55 lbf.in. (0.23 and 0.62 m.daN) while aligning cotter pin holes and install a new cotter pin.

(d)Remove safety clips and tags and close circuit breakers. Close core, thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).

CAUTION : MAKE SURE YOU CYCLE THE ECS AND ANTI-ICE SYSTEMS DURING ENGINE IDLE. FUMES IN THE CABIN CAN OCCUR IF YOU DO NOT CYCLE THE ECS AND ANTI-ICES SYSTEMS.

(9)Within 24 hours from the last wash cycle, use the Power Plant Operation (Normal) procedure to operate the engine (Ref. 71-00-00, P. Block 501) as follows. This test has to be performed before the next flight or within 24 hours from performing the water wash, whichever occurs first.

(a)Operate the engine at minimum idle for five minutes.

(b)Cycle the ECS and anti-ice systems three times during the idle run.

(c)Verify the engine is operating at the correct N2 speed for ground idle.

4. Specific Area Cleaning

A. This procedure contains methods for cleaning specific areas and removing light-dirt accumulations, hydraulic fluids and fire extinguishing agents.

WARNING : CLEANING SOLVENTS ARE HIGHLY FLAMMABLE, VOLATILE, AND TOXIC. THEY SHOULD BE USED WITH ADEQUATE VENTILATION. AVOID PROLONGED BREATHING OF VAPORS AND REPEATED OR PROLONGED CONTACT WITH THE SKIN.

CAUTION : SOME PLASTICS AND RUBBER-BASE MATERIALS ARE ATTACKED BY HYDROCARBON SOLVENTS.

B. Hydrocarbon Method. Stoddard solvent (C04-002) is recommended for cleaning of light accumulations of grease, oil, gum and dirt. Use as follows :

NOTE : Hydrocarbon cleaning is not effective in removing baked-on oil deposits.

(1)Apply solvent (C04-002) by spraying or using soaked rag.

NOTE : A soft bristled brush may be used to remove stubborn accumulations.

(2)Wipe thoroughly to remove accumulation and dry with a clean cloth or rinse with water.

WARNING : WHEN USING THE STEAM CLEANER SPRAY GUN, OPERATOR MUST WEAR GLOVES PROTECTIVE MASK, RUBBER APRON, AND APPROPRIATE PROTECTIVE FOOTWEAR.

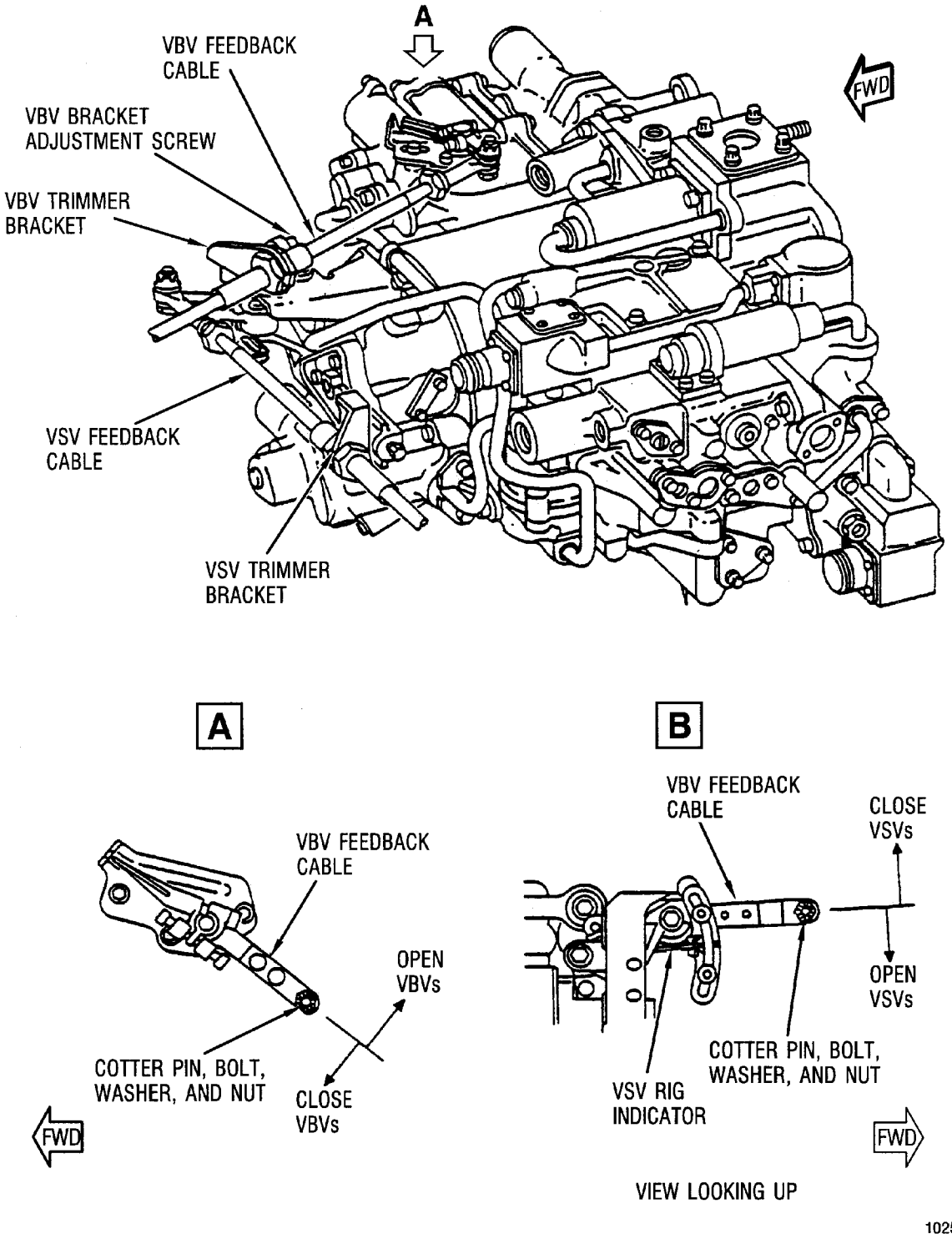
C. Steam Cleaning Method. Steam cleaning is a superficial cleaning process that is useful when it is not desirable to remove paint and surface coatings.

NOTE : Do not use any steam cleaning compounds.

Apply steam using standard equipment/methods. Avoid dwelling in one area when steam cleaning plastic parts.

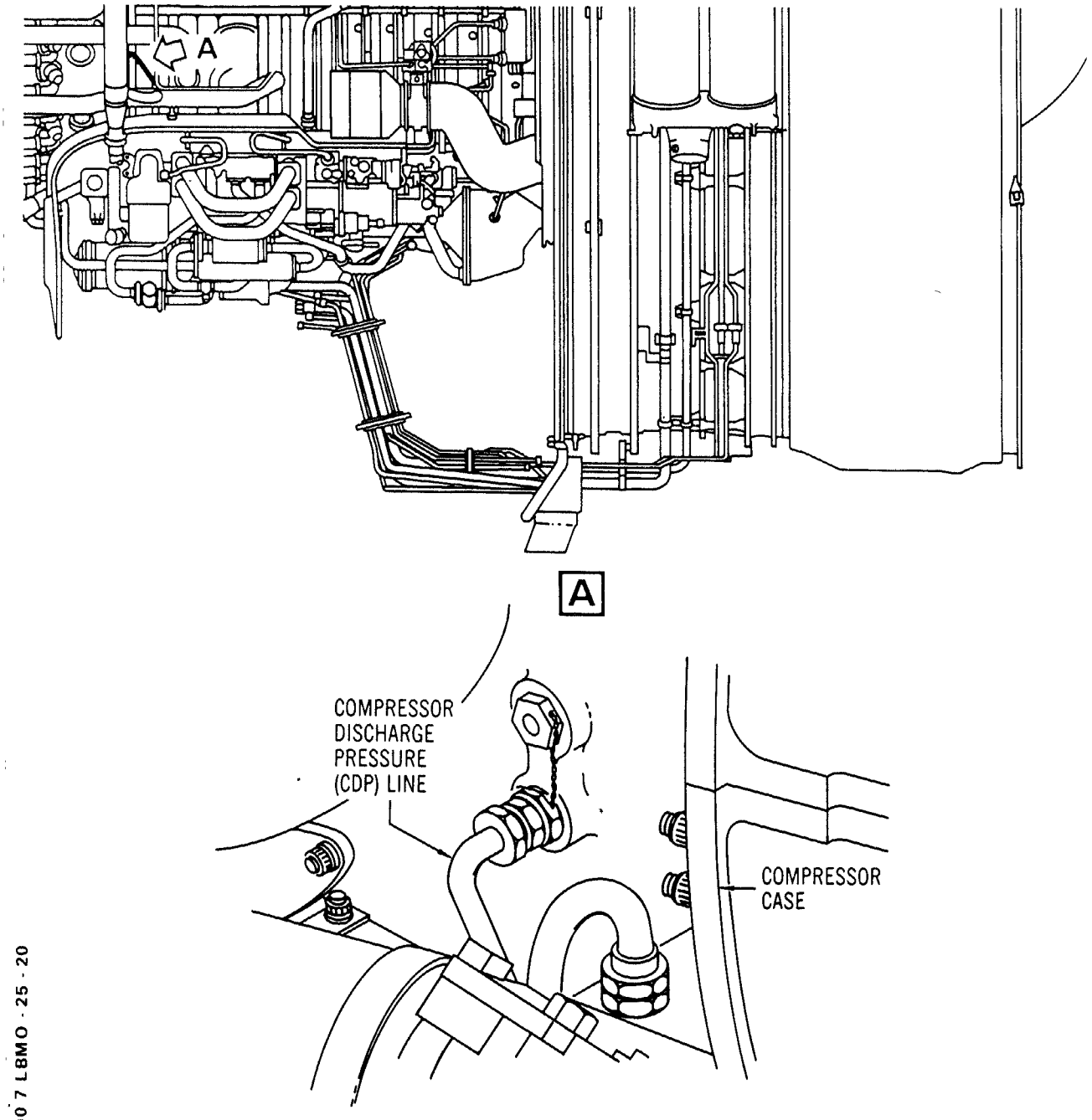
D. Removal of Hydraulic Fluid

CAUTION : REMOVE HYDRAULIC FLUID IMMEDIATELY. UNDER CERTAIN CONDITIONS,

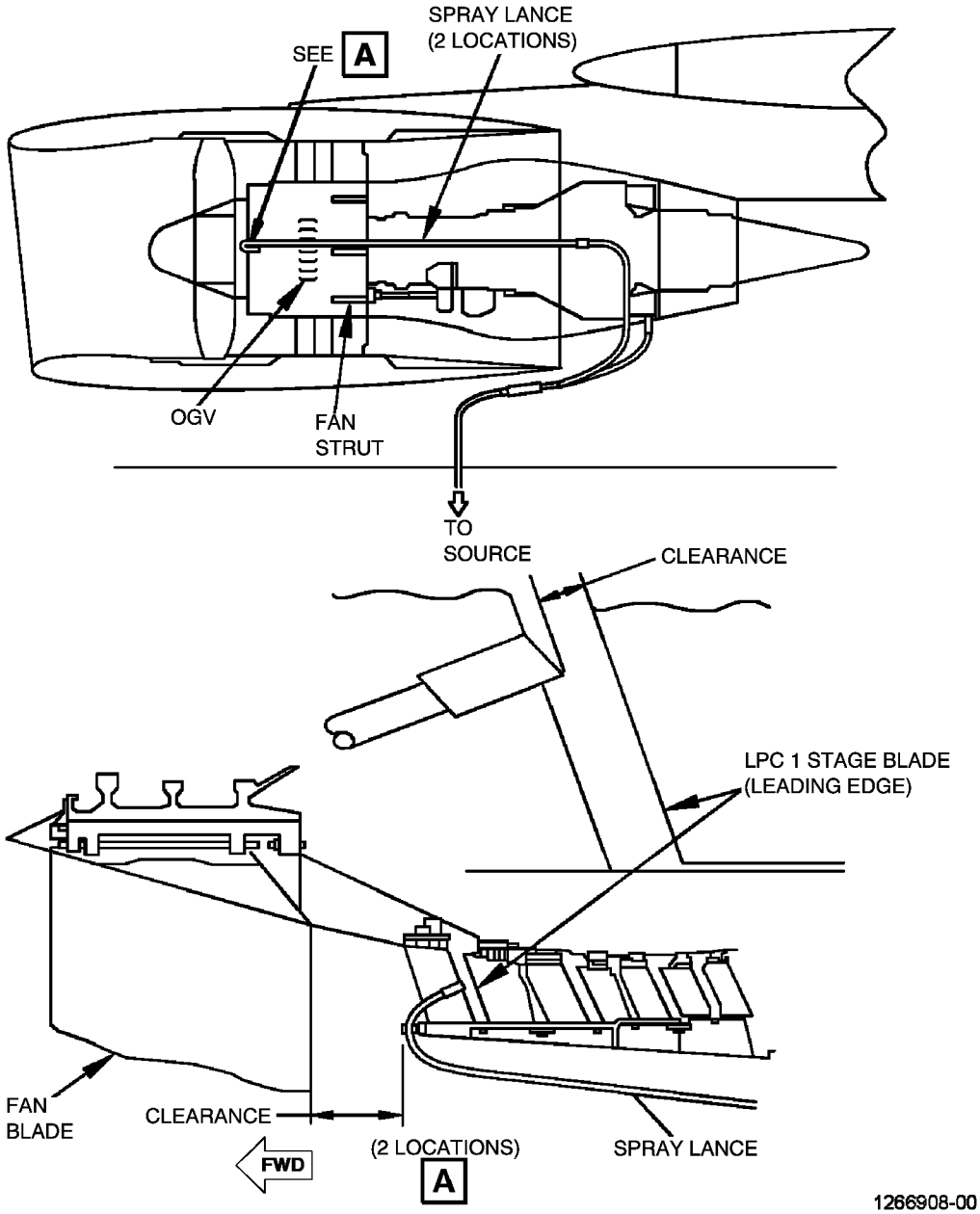


BM5 72 00 00 7 LAM0 01

VSV/VBV Positioning by Engine Motoring Method
Figure 701



CDP Line Connection to Compressor Rear Frame
Figure 702



BM5 720000 7 LDM0 00

Installation of the Spray Lances
Figure 703

R

HYDRAULIC FLUID MAY CAUSE INTER-GRANULAR ATTACK ON ENGINE METALS, ALONG WITH ATTACK ON RUBBER, PLASTICS, AND PAINTS.

(1)Remove hydraulic fluid with a clean cloth.

WARNING : CLEANING SOLVENTS ARE HIGHLY FLAMMABLE, VOLATILE, AND TOXIC. THEY SHOULD BE USED WITH ADEQUATE VENTILATION. AVOID PROLONGED BREATHING OF VAPORS AND REPEATED OR PROLONGED CONTACT WITH THE SKIN.

(2)Wash with Stoddard solvent (C04-002).

(3)Wipe dry with clean cloth or water rinse.

E. Removal of Fire Extinguishing Agents - External

(1)If the engine has sustained fire damage, it must be removed from the airplane for inspection.

(2)If the engine has been exposed to fire extinguishing agents (without a fire) on its external surfaces, perform the following :

(a)Carbon dioxide (CO2) contamination.

1 Cold Sections : Parts not exposed to heat require no maintenance action.

2 Hot Section : Parts exposed to heat at time of contamination must be removed for inspection.
Refer to applicable sections in Maintenance and Engine Manuals.

(b)Foam extinguishing agents

CAUTION : DO NOT ALLOW FOAM TO ENTER ANY ENGINE CAVITIES. FOAM RESIDUE MAY CAUSE CORROSION DAMAGE.

1 Wash with clean water and brush to remove all foam agents.

(c)Dry chemical powder agents

CAUTION : DO NOT USE WATER. DRY AGENTS COMBINES WITH WATER TO FORM AN EVEN MORE CORROSIVE COMPOUND.

1 Clean all loose powder from engine using vacuum tools and compressed air at 30-40 psi (207-276 bars) as required.

CAUTION : DO NOT ALLOW CLEANING AGENT TO ENTER ANY ENGINE CAVATIES RESIDUE WILL CAUSE CORROSIVE DAMAGE.

2 If powder has turned to glaze due to elevated temperatures, scrub with a mixture of 60 percent isopropyl alcohol (C04-035)/40 percent isobutyl alcohol (C04-151) until all glaze is removed and then steam clean.

(d)Halogenated hydrocarbon contamination

1 Rinse exposed areas using clean running water.

5. Coke Ingestion Cleaning of Engine Airfoils

(Ref. Fig. 704)

Coke cleaning instructions to remove service-accumulated deposits from core engine airfoils are as follows :

WARNING : COKE CLEANING REQUIRES POSITIONING OF THE GRIT-BLAST OPERATOR DIRECTLY IN FRONT OF AN OPERATING ENGINE. TO PREVENT PERSONNEL INJURIES, ALL SAFETY PRECAUTIONS MUST BE OBSERVED.

A. Safety Precautions

(1)Chock all aircraft wheels.

(2)Position grit-blasting machine and air source equipment at least 30 feet (9.1 m) from nacelle inlet and secure machine so that when outlet hose

and wand are fully extended, the tip of the wand will reach more than 8 feet (2.4 m) from lip of nacelle.

(3)Position an observer at least 50 feet (15.2 m) from nacelle inlet in location that provides visual contact with the throttle operator and grit-blast operator.

NOTE : Observer must maintain constant communication (headset/mike) with throttle operator.

(4)Grit-blast operator must :

(a)Empty pockets and remove all loose exterior objects such as badges, caps, etc., that may become dislodged.

(b)Wear safetybelt connected by tether to a secure object. Maximum length of tether when fully extended must restrain operator from reaching within 10 feet (3 m) of nacelle lip.

(c)Use eye goggles for eye protection from flying debris and ear protective gear to reduce the possibility of ear damage due to loud noise generated during cleaning operation.

(5)All personnel in vicinity must observe hazard and danger areas (Ref. 71-00-00, P. Block 501) while engine is running.

B. Procedure

(1)On panel 436VU, release ENG 1 (2) BLEED VALVE and HP VALVE pushbutton switches and place a warning notice to prevent inadvertent actuation.

CAUTION : THE FUNNEL-SHAPED TOP ON THE GRIT-BLASTING MACHINE IS A TEMPTING PLACE FOR PERSONNEL TO DISCARD DEBRIS AND SMALL PIECES OF PAPER IF MACHINE IS NOT SECURELY COVERED DURING STORAGE OR WHEN NOT IN USE. THE MACHINE SHOULD BE CLEARED OF CONTAMINANTS AND USED ONLY FOR COKE CLEANING.

(2)Temporarily block the three fan air inlet ducts at the 2:30, 4:00 and 9:30 o'clock positions with Material No.C10-012 or equivalent.

(3)Make certain that the grit-blasting machine is free of contaminants.

(4)Install safetybelt with tether, eye goggles and ear protective gear.

WARNING : DO NOT STAND DIRECTLY OVER POT WHILE PRESSURIZING. A SMALL AMOUNT OF GRIT MAY BE BLOWN FROM TOP VALVE AS POT SEALS.

(5)Load hopper of grit-blasting machine with 25 pounds (11.3 kg) of coke (C04-026), sifting through a fine screen ; then pressurize pot to 80 psig (5.51 bars).

(6)Check for position and security of equipment as described in Safety Precaution paragraph.

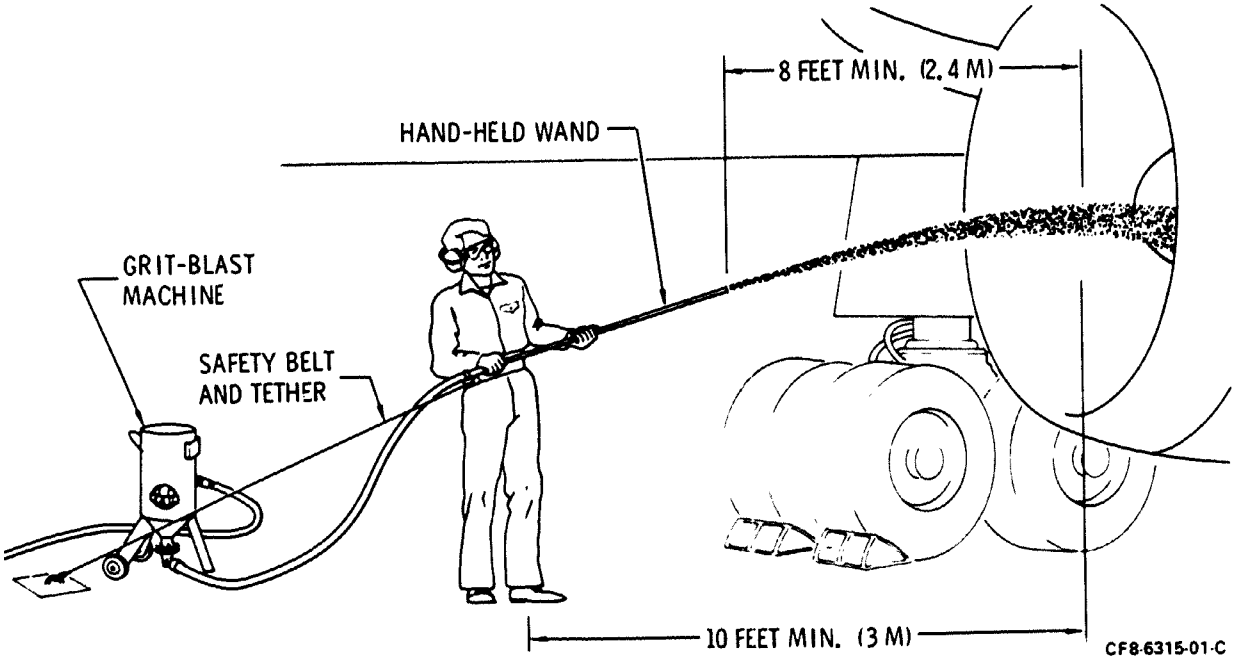
WARNING : DO NOT OPERATE ENGINE ABOVE APPROACH IDLE POWER SETTING DURING COKE INGESTION.

(7)Start engine and stabilize at Approach Idle power setting (Ref. 71-00-00, P. Block 501).

(8)With engine running at Approach Idle power setting, position operator centered in front of nacelle at least 10 feet (3 m) from lip of inlet with hand-held wand and signal assistant to turn on grit-blasting machine. Do not change throttle setting once cleaning is initiated.

(9)Direct coke stream to base of blades (at outer edge of spinner) so coke is evenly distributed around the complete circumference of spinner. Adjust flow rate to use 25 pounds (11.3 kg) of coke ingested in 1-1/2 to 2 minutes.

(10)Terminate coke cleaning when 25 pounds (11.3 kg) of coke has been



BM5 72 00 00 7 LCMO · 14 · 09
DM5

Coke Ingestion Procedure
Figure 704

ingested.

NOTE : 25 pounds (11.3 kg) has been found to be optimum amount to restore engine. Use of additional coke does not improve cleaning.

NOTE : Shake grit-blasting machine slightly to ensure that all of the coke has been ingested.

(11)After coke cleaning, continue to run the engine for five minutes at Approach Idle to ensure that engine systems have been completely purged of residual coke.

(12)Shut down engine (Ref. 71-00-00, P. Block 501).

(13)Remove Material No.C10-012 or equivalent, temporarily blocking the three fan air inlet ducts.

(14)Remove warning notice and press **ENG 1(2) BLEED VALVE** and **HP VALVE** pushbutton switches.

HOSES AND TUBE ASSEMBLIES - INSPECTION/CHECK

1. General
This procedure pertains to the inspection and check of hoses and tube assemblies.

2. Visual Inspection/Check

A. Equipment and Materials

ITEM	DESIGNATION
(1)RSE1060	Spanner Wrench
(2)RSE1071	Wrench Set
Referenced Procedures	
- 70-00-00, P. Block 201	Engine Standard Practices
- 72-52-00, P. Block 601	Stage 2 High Pressure Turbine Nozzle Assembly
- 72-56-00, P. Block 601	Low Pressure Turbine Stator Assembly
- 73-13-03, P. Block 601	Fuel Manifold to the Fuel Pump

B. Inspect the Following :

NOTE : Inspect the shrouded fuel nozzle feeder manifold, fuel manifold, and fuel tubes (Ref. 73-13-03, P. Block 601).

NOTE : Inspect low pressure turbine clearance control and 7th stage cooling manifolds (Ref. 72-56-00, P. Block 601).

NOTE : Inspect high pressure turbine active clearance control manifold (Ref. 72-52-00, P. Block 601).

(1)Tubing for :

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(a)Splits, cracks or kinks	Not serviceable	Replace tube
(b)Dents or flat areas	Any amount provided deviation from contour does not exceed 20 percent of original tube OD	Replace tube
(c)Nicks or scores in straight section	Max. depth not to exceed 0.005 in. (0.13 mm)	Replace tube
(d)Nicks or scores in bend section	Not serviceable	Replace tube
(e)Clogged upper pylon and J-box drain tube	Any amount provided no flow restrictions	Clean tube (Ref. 70-00-00, P. Block 201).

(2)Tubing Wear Pads for :

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(a)Cracks in pad-to-tube braze	Any amount provided pad remains in position, attached to tube	

(3)Tube Seating Surfaces for : (Ref. Fig. 601)

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(a)Circumferential scratches area "A" and "C"	Any amount after removal of high metal	Remove high metal
(b)Circumferential scratches area "B"	Any amount not detectable using a 0.040-in. (1.02 mm) radius ball scribe	Remove high metal
(c)Axial scratches area "A" and "C"	Any amount after removal of high metal	Remove high metal
(d)Axial scratches area "B"	Not serviceable	Replace tube
(e)Nicks and pits area "C"	Any amount not more than 1/32 in. (0.8 mm) deep after blending.	Blend depressions
(f)Nicks and pits area "A" and "B"	Not serviceable	Replace tube
(g)Circumferential score marks on silver plated seating (mating) surface	Any amount provided score mark does not penetrate parent metal	Replace tube

(4)Tube and Hose Fitting Nuts for :

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(a)Damaged corners	Any amount provided proper torque can be obtained	
(b)Damaged thread	One full thread cumulative or continuous may be missing after chasing threads	Chase threads
(c)Damaged safety-wire holes	Hole deformation and wear is acceptable provided metal around hole is not cracked or torn	If damage exceeds limits, drill new safety-wire holes in remaining nut flats, the same

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
		diameter and the same distance from the end of the nut

(5)Swivel Flange Fittings for : (Ref. Fig. 602)

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(a)Nicks or scratches on seating surface (surface B)	Not serviceable	Replace tube
(b)Nicks or scratches on mating surfaces (surfaces A and C)	Any nick or scratch not exceeding 0.020 in. (0.51 mm) deep after removal of high metal	Remove high metal
(c)Cracks	Not serviceable	Replace tube
(d)Seating surface (surface B) out-of-flat	0.006 in. (0.15 mm) out-of-flat	Replace tube
(e)Cracks extending outward from bolt holes	Cracks in the outer radius only of bolt holes are acceptable provided not more than 2 bolt holes are affected	Replace tube
(f)Weld joint cracks	Not serviceable	Replace tube

(6)Tube and Hose Assembly for :

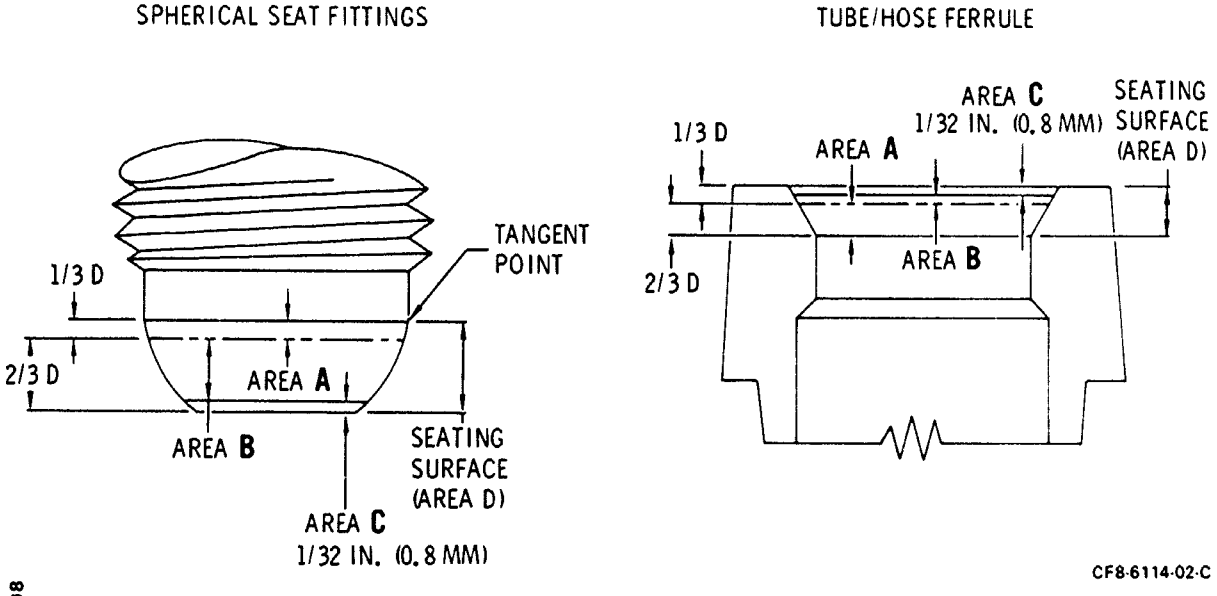
INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
Leakage	Not serviceable	Replace tube

(7)Hose Assemblies for :

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(a)Broken hose braid	3 broken wires per plait and no more than 6 broken wires per assembly or per lineal foot of hose	Replace hose
(b)Crimps	Not serviceable	Replace hose
(c)Internal obstructions	Not serviceable	Remove obstruc-

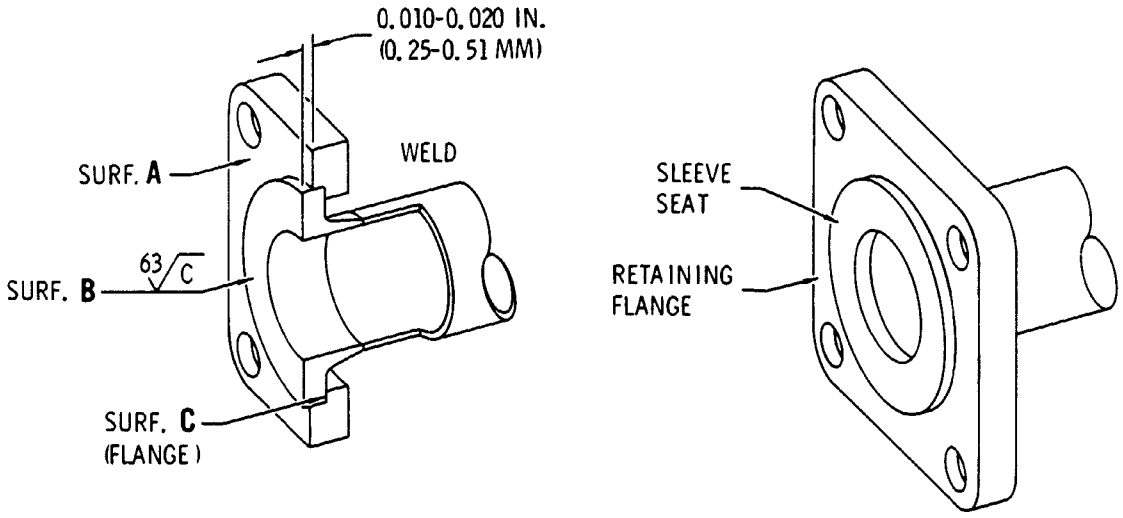
INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
		tion or replace hose
(d)Cuts, tears, chafing of fire sleeves	Any number max. depth not to exceed 1/2 of sleeve thickness	Replace sleeve
(8)Tube misalignment fittings for :		

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
Looseness	Not serviceable	Tighten using wrench, RSE 1060 or RSE 1071



BM5 72 09 03 6 LAMO - 13 - 08
DM5

Tube and Hose Fitting Seating Surfaces
Figure 601



BM5 72 09 03 6 LCMO - 13 - 08
DM5

Inspection of Swivel Flanged Connectors
Figure 602

1. General
This procedure pertains to the inspection and check of engine brackets and clamps.

2. Visual Inspection/Check

A. Cushion Clamps for :

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(1) Cracks	Any amount provided clamp is not broken	Replace clamp
(2) Wear on cushion	Any amount provided clamp will securely hold tube	Replace clamp

B. Coupling (V.Band) Clamps for :

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(1) Cracks	Any amount provided clamp is not broken	Replace clamp
(2) Dents and nicks on strap and retainer	Any amount provided tubing is not damaged	Replace clamp
(3) Damage to T-bolt and shank	Any amount provided clamp can be assembled	Replace clamp
(4) Damage to nut threads	Not serviceable	Replace nut

C. Brackets for :

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(1) Cracks adjacent to mounting bosses	Any amount provided bracket is not broken	Replace part or weld
(2) Deformation	Any amount provided bracket is not broken	Replace part or weld
(3) Broken or missing ears	Not serviceable	Replace part or weld

D. Metal Gaskets for :

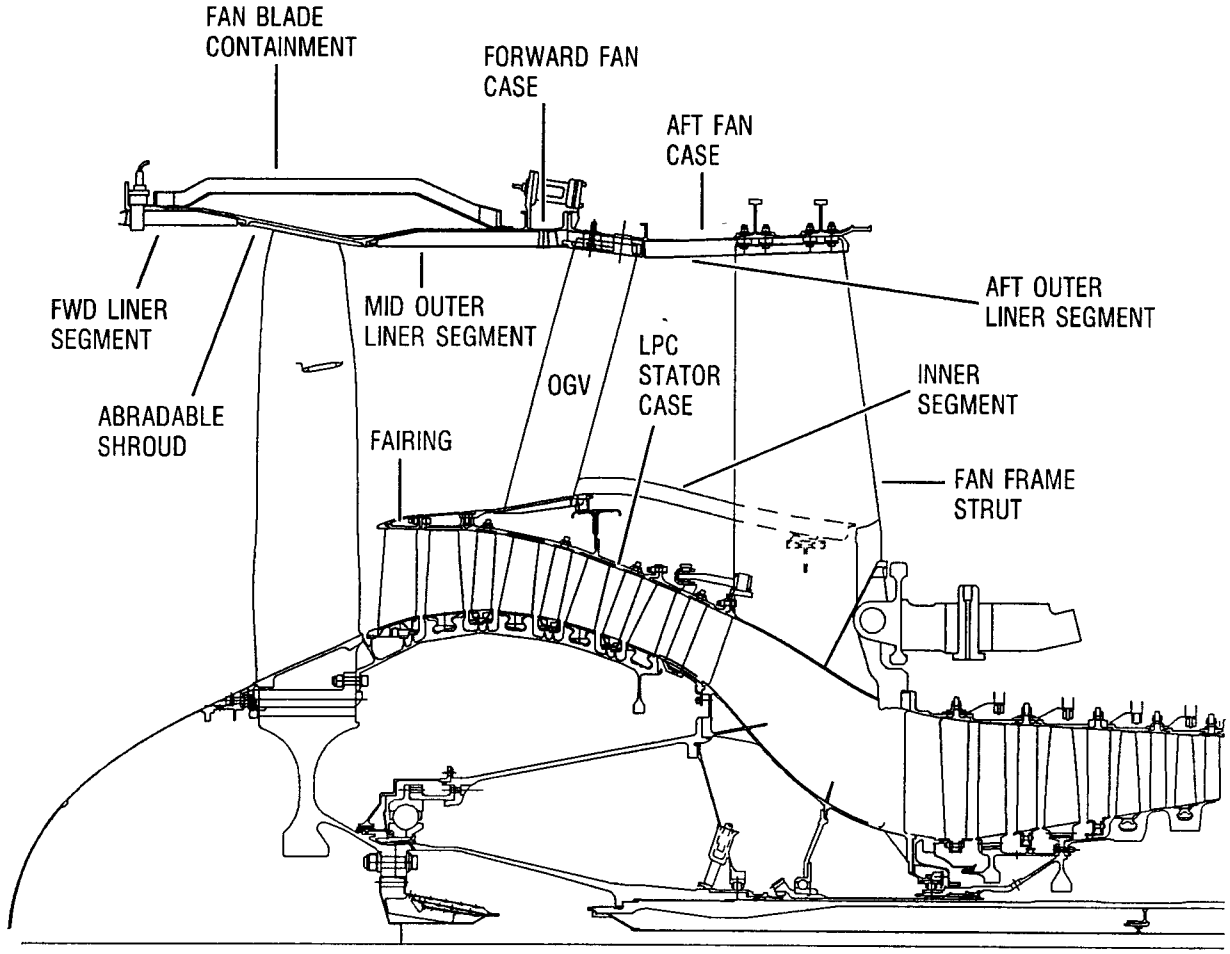
INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(1) Nicks, cuts or gouges across sealing surface	Not serviceable	Replace gasket
(2) Hard or brittle sealing material	Not serviceable	Replace gasket
(3) Protruding sealing material	0.018 in. (0.45 mm) above metal surface	Replace gasket

AIR INLET SECTION- DESCRIPTION AND OPERATION

1. General
The induction system provides airflow to the engine of sufficient quality (inlet recovery and distortion) to ensure the engine will meet ground and flight operational performance and stability requirements.

2. Fan Module (Ref. Fig. 001)

A. The fan is a large diameter, high bypass ratio, 5-stage, axial flow, front mounted fan driven by the low pressure turbine. Main components of the fan section are the frame, the stator and the rotor.
(1) The fan frame is the major support structure. It supports the front of the compressor, the fan rotor, fan stator, inlet gearbox and the forward engine mount. It also provides a variable valve system that consists of 12 variable bleed valves located between the struts.
(2) The fan rotor has a large diameter - 2362 mm (93 inches) - first stage, and 4 reduced diameter second, third, fourth, and fifth stages which supercharge the inner portion of the fan flow which enters the compressor.
(3) The fan forward-shaft connects the fan rotor to the low pressure turbine rotor. The shaft transmits torque from the turbine rotor to the fan rotor.
(4) The fan stator contains fixed stator vanes mounted behind all stages of the rotor. Inlet guide vanes have been eliminated to reduce inlet noise. Acoutic panels line the fan casing to further reduce sound levels.



BM5 72 20 00 0 LEMO - 01

Fan Module Section
Figure 001

FAN ROTOR ASSEMBLY - DESCRIPTION AND OPERATION

1. General

A. The fan rotor assembly is a major subassembly of the fan module.

B. The major components of the fan rotor assembly are as follows : the fan spinner, stage one disk, stages 2 through 5 spool, stages 1 through 5 blades, and fan forward shaft. (Ref. Fig. 001)

C. The major function of the fan rotor assembly, by means of the stage 1 blades, is to develop thrust by accelerating the speed of the air being ingested into the engine inlet.
Secondly, the stages 2 through 5 blades working with the stages 1 through 5 fan stator vanes act as a low pressure compressor and an inlet to the high pressure compressor.

2. Fan Rotor Assembly (Ref. Fig. 001)

A. Stage One Disk
The disk is forged and machined from titanium. Axial dovetail slots allow individual stage one blade removal/installation from the front of fan without major disassembly. The stage one disk retains the 38 first stage blades and blade retainers. The disk also supports the stages 2-5 spool and the spinner. The spinner bolts to the forward face of the disk ; the forward shaft bolts to the aft inner flange and stages 2-5 spool bolts to the aft outer flange of the disk.

B. Spool
The spool is forged and machined from titanium. The spool has circumferential dovetail slots and carries four stages of blades on a single piece of rotor structure. The spool retains stages 2 through 5 blades, locking lugs and balance weights. Rotating air seal serrations are machined between each stage on the outside diameter of the spool.

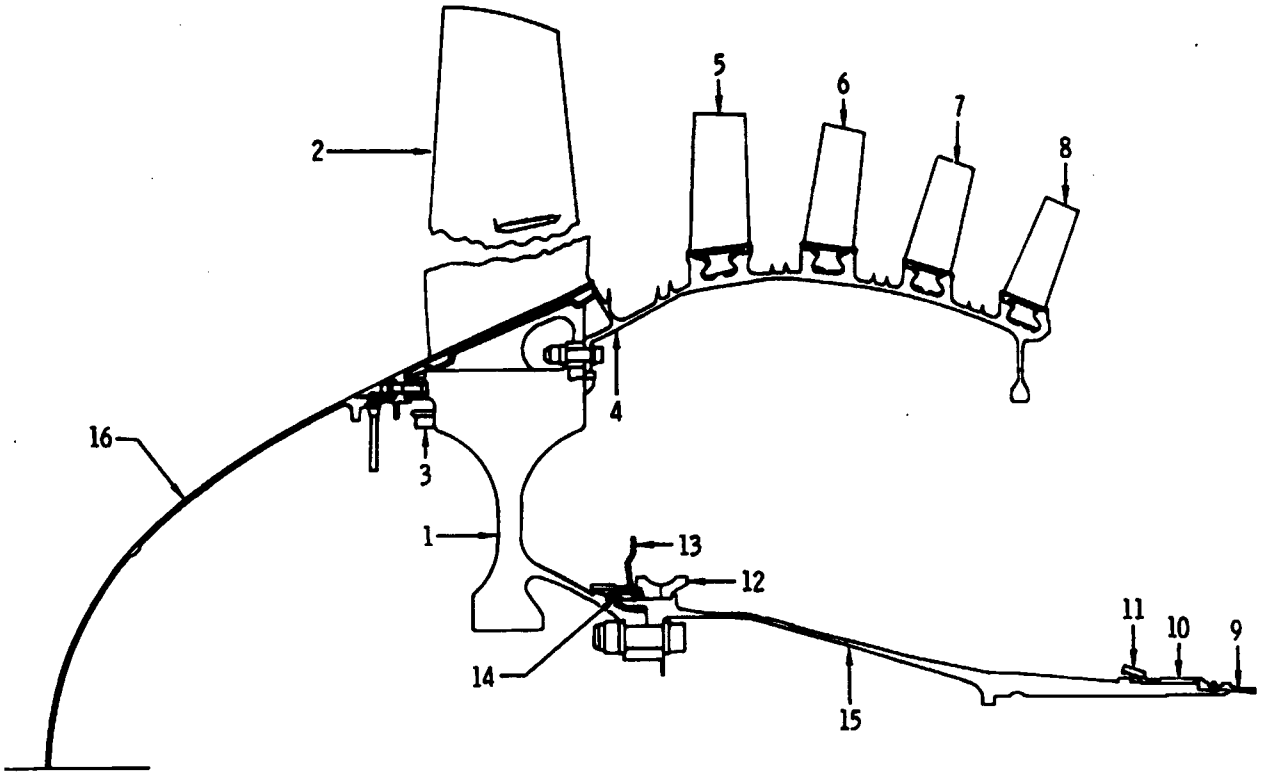
C. Blades
Fan rotor blades are made of titanium to obtain the proper combination of strength and weight. The first stage blades are retained in the disk dovetail axial slots. The stages 2 through 5 blades are retained in the spool circumferential dovetail slots. Integral platforms on the first stage blades provide a contoured surface for smooth airflow through the fan.

(1)Stage one blades
The stage one blades are approximately 30 in. (762 mm) long and designed with a mid span shroud that protrudes from both sides of the airfoil. The shrouds on each blade interlock with shrouds on adjacent blades to form a continuous ring which adds torsional rigidity and dampens vibration. A spring loaded, keyed spacer exerts a radial force on the blade while the keyed retainer engages the forward flange of the disk to prevent the blades from moving axially forward. Removal of the spacer allows blades to move radially inward. This disengages the mid-span shrouds allowing individual blade removal/installation.

(2)Stages 2 through 5 blades
The second through fifth stage blades range from 6 in. (152.4 mm) down to 4.75 in. (120.6 mm) in length and serve primarily to supercharge the compressor. Blades are held circumferentially in the dovetail slots by locking lugs.

D. Spinner
The one piece cone forms a fairing to guide airflow into the fan. The spinner bolts to the stage one disk. A shoulder in the spinner contacts the forward face of the disk, covers dovetail slots and helps holding blades axially in the slots. The spinner retains balance screws that aid in the balancing of the fan rotor assembly.

E. Fan Forward Shaft
The forward shaft is a cone shaped stub shaft bolted to the stage one disk and splined at the aft end to mate with the fan mid shaft. The No. 1 bearing inner race and rotating oil seal are mounted on the forward end of the shaft. The fan speed sensor pickup and No. 2 bearing inner race are mounted on the aft end of the shaft.



LEGEND:

1. STAGE 1 DISK
2. STAGE 1 BLADES
3. STAGE 1 BLADE RETAINERS
4. STAGES 2-5 SPOOL
5. STAGE 2 BLADES
6. STAGE 3 BLADES
7. STAGE 4 BLADES
8. STAGE 5 BLADES
9. NO. 2 BRG INNER RACE NUT
10. NO. 2 BRG INNER RACE
11. FAN SPEED SENSOR PICKUP
12. NO. 1 BRG INNER RACE
13. NO. 1 BRG AIR/OIL SEAL
14. NO. 1 BRG SPANNER NUT
15. FORWARD ROTOR SHAFT
16. FAN SPINNER

1025940-00-A

BM5 72 21 00 0 LAMO 00

Fan Rotor Assembly
Figure 001

FAN ROTOR ASSEMBLY - REMOVAL/INSTALLATION

1. General

This procedure provides the removal and installation instructions for the stage 1 fan blades. This procedure is in two parts; one for selective blades and the other for a complete set of blades. This procedure also includes the fan blade tip-to-shroud clearance inspection. Access to the stage 1 fan blades is from the front of the engine.

2. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Fan Blade Stop
C. 2C8073	Fixture, Stage 1 Fan Blade Preload-Spacer
D. 2C6894	Tool, Removal, Fan Spinner
E. 2C14722	Fixture, Runout
F. MSE-54	Extractor, Fan Blade Retainer Key
G.	Torque Wrench 0-100 lbf.in. (0-1.13 m.daN)
H.	Indicator, Dial
I.	Gage, Feeler
J.	Access Platform
K. Material No.C02-003	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
L. Material No.C02-019	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
M. Material No.C02-078	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
N. Material No.C04-001	Cleaning Compounds and Solvents (Ref. 70-00-00)
O. Material No.C04-003	Cleaning Compounds and Solvents (Ref. 70-00-00)
P. Material No.C04-035	Cleaning Compounds and Solvents (Ref. 70-00-00)

Referenced Procedures

- 71-13-00, P. Block 301	Cowl Doors
- 72-00-00, P. Block 501	Engine - General
- 72-21-00, P. Block 801	Fan Rotor Assembly
- 72-23-00, P. Block 801	Fan Frame and Case Assembly

3. Procedure (for selective blades)

WARNING : MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR THRUST REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

A. Job Set-Up

(1)Open, safety and tag the appropriate circuit breakers and open fan and thrust reverser doors (Ref. 71-13-00, P. Block 301).
NOTE : Open only the circuit breakers for the applicable engine.
(2)Install access platform.

B. Removal of a Damage Stage 1 Fan Blade (10 fan blades or less) (Ref. Fig. 401)
NOTE : Refer to paragraph 4. to remove more than 10 fan blades.

C. Removal of a Stage 1 Fan Blade
CAUTION : WHEN YOU REMOVE ALL PARTS, EXCEPT BOLTS AND NUTS, TAG THE PARTS WITH A MATCHMARK. ASSEMBLE PARTS IN THE SEQUENCE REMOVED. MAKE A MARK WITH APPROVED MATERIAL ONLY. AN INCORRECT ALIGNMENT OF THE PARTS CAN CAUSE VIBRATION IN THE FAN ROTOR AND DAMAGE TO THE ENGINE.
(1)Make a mark to align the fan spinner to the platform on the stage 1 fan blade.
NOTE : The No. 1 fan blade is the second blade counterclockwise from the offset hole when you look aft. The offset hole in the fan spinner is identified with the letter O on the flange. The counterbore hole is painted whits.
CAUTION : BE CAREFUL THAT THE FAN SPINNER DOES NOT FALL AND BECOME DAMAGED WHEN RELEASED FROM THE DISK.
(2)Remove the fan spinner and seal ring (Ref. 72-21-00, P. Block 801).
WARNING : MAKE SURE YOU USE GLOVES WHEN YOU TOUCH THE FAN BLADES. THIS WILL PREVENT INJURY TO THE HANDS.
(3)Mark the stage 1 fan blades to the retainers and the spacers to keep them as a set.
(4)Turn the rotor until the fan rotor blade is at the 12 o'clock position before it is removed.
(5)Loosen the two blades adjacent to the damaged blade. If necessary, remove the two adjacent blades to the damaged blade when the damaged blade is removed. Be sure to identify adjacent blades by engine location.
(6)Remove the bolts and the balance weights (if installed) from the damaged blade and the two adjacent blades.
(7)Write or make a mark of the balance weights in relation to the blade positions.
(8)Put a load on the spacer with the tool 2C8073 and remove key with the extractor MSE-54. Remove the tools.
(9)Hold the damaged blade radially up. Then remove the spacer and retainer from the blade.
CAUTION : MAKE SURE YOU DO NOT LET THE FAN BLADE HIT THE ABRADABLE SHROUD WHEN YOU REMOVE OR INSTALL THE FAN BLADES. IF THE BLADE HITS THE SHROUD, IT CAN CAUSE GOUGES, MARKS, OR GROOVES ON THE SHROUD.
(10)Move the damaged blade radially down to disengage the midspan shroud from the two adjacent blades. Remove the damaged blade from the disk dovetail slot and put it in a container.
R Post SB GE 72-1139
R (11)Remove the shim assembly from the blade dovetail or from the disk
R dovetail slot if the shim stays in the slot. It is necessary that

R you install a shim on the replacement blade.
R (12)Clean the shim assembly with Material No. C04.001 (Methyl-Ethyl-Ketone), C04-003 (Acetone), or C04-035 (Isopropyl Alcohol). Make sure that at least 50% molydag coating coverage remains on the shim assembly at each of the four pressure faces.
R (13)Examine the peek bumpers on the shim assembly for tears or if they are missing. If there is less than 50% molydag, or peek bumpers are torn or missing, the shim is not serviceable and you must replace it (Ref. Fig. 407).
R End Post SB GE 72-1139
R (14)Remove the two adjacent blades and put in a container or soft surface to prevent damage.
R (15)Follow steps 3.C.(3) thru 3.C.(14) to remove additional fan blades, (10 or less), if necessary.

D. Installation-Stage 1 Fan Blade (10 fan blades or less)

NOTE : If more than one blade will be replaced, do step 3.D.(1) for each blade.

(1)Prepare to replace a damaged stage 1 fan blade as follows :
(a)Replace a damaged blade as follows :
1 If the replacement blade is not more than 158 gram-inches different than the damaged blade, replace the blade. Refer to step 4.B.
2 If the replacement blade is more than 158 gram-inches different than the damaged blade, replace the blade as follows :
(b)Calculate the difference in moment-weight between the replacement blade and the damaged blade as follows :

NOTE : Be sure to use a replacement blade that is as near as possible to the original blade class code.

1 If the damaged blade had a balance weight, keep the weight to use, if necessary, at blade installation. Write down the value of the weight and show it as a positive number.
2 Subtract the moment-weight of the replacement blade from the moment-weight of the damaged blade. Write down the result and show it as a positive or negative value as applicable.

NOTE : A positive value means more weight is necessary to balance the rotor assembly. A negative value means less weight is necessary to balance the rotor assembly.

3 Divide the results by 14 to find the weight difference in grams. This weight difference will be added or removed from the location of the replacement blade. This will be used to get the correct balance of the rotor.
4 If a balance weight was used, refer to step 3.D.(1)(b)1, add this weight to the weight found in step 3.D.(1)(b)3.
Keep the applicable value sign (positive or negative).
5 If the value in step 3.D.(1)(b)4 is positive, it is the quantity of weight necessary for the replacement blade. This is to get the correct rotor balance.
Go to step 3.D.(2) if the correct balance weight is available. If the weight is not available, or is above 60 grams, go to step 3.D.(1)(b)7.
6 If the value found in step 3.D.(1)(b)4 is negative, the replacement

blade is too heavy. Do the steps that follow :

a Write down the negative gram value found in step 3.D.(1)(b)4 and make this value positive.

b Remove the blade 180 degrees from the replacement blade. Refer to step 3.C.(3) thru 3.C.(11).

c If the blade 180 degrees from the replacement blade has a balance weight, write down this value.

d Add the value of step 3.D.(1)(b)6 a to the value of step 3.D.(1)(b)6 c. This is the total balance weight that will have to be installed on the blade 180 degrees from the replacement blade, only. No weight will be installed on the replacement blade.

7 If it is not possible to get the gram value for balance, the steps that follow show alternatives that can be done.

a Try to use stick weights in the spinner to compensate during trim balance.

b Get a replacement blade with a closer moment-weight to the damaged blade.

c Change the blade 180 degrees to the replacement blade for one with a blade moment-weight near the moment-weight of the replacement blade.

d Remove all the blades and do the analysis again. (Ref. paragraph 4.C.(1)).

(2)Installation of a stage 1 fan blade as follows (10 fan blades or less) :

(a)Clean fan blade dovetails with Material No.C04-001, Material No.C04-003, or Material No.C04-035.

WARNING : MOLYKOTE D 321 R IS AN AGENT THAT IS FLAMMABLE, EXPLOSIVE AND AN IRRITANT. MAKE SURE THAT ALL PERSONS OBEY THE PRECAUTIONS WHEN MOLYKOTE D 321 R IS USED.
- GAS/AIR MIXTURES MORE THAN THE LOWER EXPLOSIVE LIMIT (LEL) CAN CAUSE AN EXPLOSION IF HIGH HEAT, SPARKS, OR FLAMES SUPPLY IGNITION.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET MOLYKOTE D 321 R IN YOUR EYES, ON YOUR SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING : MOLYKOTE G-n PASTE IS AN AGENT THAT IS FLAMMABLE, EXPLOSIVE, AND AN IRRITANT. MAKE SURE THAT ALL PERSONS OBEY THE PRECAUTIONS WHEN MOLYKOTE G-n PASTE IS USED.
- GAS/AIR MIXTURES MORE THAN THE LOWER EXPLOSIVE LIMIT (LEL) CAN CAUSE AN EXPLOSION IF HIGH HEAT, SPARKS, OR FLAMES SUPPLY IGNITION.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET MOLYKOTE G-n PASTE IN YOUR EYES, ON YOUR SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING : REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIER'S MSDS FOR :

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THESE HAZARDOUS AGENTS.

(b)Coat the following parts and areas with either the C02-078 (primary) or C02-003 (alternate) lubricant as specified.

1 Fan disk dovetail slots
- dovetail pressure faces, which contact with blade dovetail pressure faces
- exposed forward flange of the booster spool (or alternately coat aft face areas of the blade shank)
- slot bottoms
- aft lug ears of post (this area can touch the fan blade).

2 Fan blade midspan shroud contact/mating surfaces.

3 Fan blade area below the platforms
- fan blade dovetail pressure faces (disk contact surfaces)
- blade shank fore and aft faces (or alternately the retainer and exposed forward flange of the booster spool).

4 Spacers, retainers and keys.

R Post SB GE 72-1139

R 5 Shim assembly inner and outer pressure faces, and all other
R inner surfaces of shim assembly.

R End Post SB GE 72-1139

NOTE : The objective and intent of the lubricant application is to cover the blade-to-blade and blade-to-disk contact surfaces with a liberal amount of lubricant. Thickness values are not a requirement, but the application must cover required surfaces with a continuous, constant coating of lubricant as determined visually by the technician. There can be some material that will squeeze out and centrifuge outward ; however, an application that is not constant or is patchy (minimal) may not be effective. An application that is more than sufficient is better as long as it is not so much that it affects the rotor balance. Overcoat, oozing, centrifuging is permitted.

(c)Use of lubricant C02-078 Molykote G-n Paste (primary).

1 Apply Molykote G-n Paste (C02-078) manually from an uncontaminated container. Use a clean brush or gloved finger to apply to the components. Install fan blade immediately in the fan disk position from which it was removed. Do not clean off contact surface (remove excess). After assembly, removal of squeeze-out, ooze, or excess is permitted. Do not put fan blade on any surface after lubricant has been applied. Contamination of lubricant can occur. Use the same procedure for all parts that require lubrication. The use of this paste (grease-like) lubricant does not require drying time or curing time and assembly can immediately follow application.

WARNING: DO NOT TRY TO DRY OR CURE BY USE OF A HEAT GUN. HIGH TEMPERATURE OR HOT AIR WILL REMOVE THE MINERAL OIL AND WAXES IN THE PRODUCT, CAUSE FLAKING OR POWDERING AND SIGNIFICANTLY REDUCE LUBRICANT ADHERENCE AND

PERFORMANCE.

(d)Use of lubricant C02-003 Molykote D 321 R (alternate).

1 Apply two coats of lubricant. Let each coat air dry at 73°F (23°C) for 5 to 15 minutes (longer in cold and/or humid environments). The recommended/optimal spray standoff distance is 12 to 15 in. (305 to 381 mm). Overspray of this lubricant is permitted. Wet lubricant can act as glue and hold the fan blade in a position which does not agree with that of the original fan balance. This can cause a shift in fan balance. Do not install the blades in the disk until the two coats of lubricant have dried.

WARNING : LUBRICATING OIL IS AN AGENT THAT IS AN IRRITANT. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN LUBRICATING OIL IS USED.
- DO NOT USED IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET LUBRICATING OIL IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE MIST.

WARNING : REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIER'S MSDS FOR :
- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THESE HAZARDOUS AGENTS.

(e)Apply Material No.C02-019 to the threads of the bolts.

R Post SB GE 72-1139

R CAUTION : MAKE SURE YOU LUBRICATE THE SHIMS BEFORE YOU INSTALL THEM ON THE FAN DISK DOVETAILS. MAKE SURE YOU INSTALL THE SHIMS ON THE FAN DISK DOVETAILS. MAKE SURE THERE IS A SUFFICIENT AMOUNT OF MOLYDAG COATING ON THE FAN DISK DOVETAILS. IF YOU DO NOT OBEY THESE PROCEDURES, DAMAGE TO THE FAN DISK CAN OCCUR.

R CAUTION : MAKE SURE THE PEEK BUMPERS ARE NOT TORN OR MISSING. DAMAGE TO THE BOOSTER SPOOL CAN OCCUR.

(f)Install the lubricated shim assembly on the fan blade before
R you install the fan blade. Install the shim assembly from the aft end
R of the fan blade dovetail. Make sure the tabs face aft.

R End Post SB GE 72-1139

R (g)Turn the first stage slot into position, where the blade is installed, to the 12 o'clock position.

CAUTION : MAKE SURE YOU DO NOT LET THE FAN BLADE HIT THE ABRADABLE SHROUD WHEN YOU REMOVE OR INSTALL THE FAN BLADES. IF THE BLADE HITS THE SHROUD, IT CAN CAUSE GOUGES, MARKS, OR GROOVES ON THE SHROUD. THIS CAN ALSO CAUSE POSSIBLE SHROUD EROSION.

R (h)Install the fan blade and adjacent blades into the slots in the stage one disk. If additional blades (10 total replaced) were removed, install them at this time.

R (i)After the fan blades are installed and in position, install the

retainer hardware. Hold each fan blade up to install a retainer, then put a spacer through the retainer.

R (j)Apply a load to the spacer with the tool 2C8073, and then install a key. After the key is installed, remove the tool 2C8073.

R (k)Install the balance weight that was calculated as necessary.

R (l)Install bolt in the balance weight and TORQUE the bolt to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN).

R (m)Install the retainer hardware for the two adjacent blades. Refer to steps (f) thru (i).

R (n)If necessary, and if not already done, replace the balance weight of the blade 180° from the replacement blade as calculated.

(3)(Optional procedure) Apply sealant between the blade dovetail slots (Ref. 72-21-00, P. Block 801).

(4)Install the fan spinner (Ref. 72-21-00, P. Block 801).

E. Close-Up

(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(2)Remove the fan blade stop from the engine.

(3)Remove access platform.

(4)Remove safety clips and tags and close circuit breakers.

4. Procedure (for a complete set of blades)
WARNING : MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR THRUST REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open fan and thrust reverser doors (Ref. 71-13-00, P. Block 301).
NOTE : Open only the circuit breakers for the applicable engine.
(2)Install access platform.

B. Removal of all the Stage 1 Fan Blades (Ref. Fig. 401)
R NOTE : If the fan blade removed has a shim assembly at the dovetail
R (Ref. Fig. 401), any fan blade going into this same disk will also
R need a shim assembly. Pressure faces inside and outside the shim
R assembly should be lubricated the same as specified for the fan
R blade and stage 1 disk pressure faces
R Upon blade removal, check to make sure the shim, if present, is
R located and does not remain in the disk or on the fan blade. The
R peek bumpers (Ref. Fig. 401) must not be torn or missing. It is
R not serviceable if torn. In this case replace shim.
R Examine that there is at least 50% molydag coating coverage
R remaining on the shim, at each of the 4 pressure faces shown in
R (Ref. Fig. 407). It is not serviceable if there is less than
R 50%. In this case replace shim
(1)Make a mark to align the fan spinner to the platform of the stage 1 fan blade.
NOTE : The No. 1 fan blade is the second blade counterclockwise from the offset hole when you look aft. The offset hole in the fan spinner is identified with the letter O on the flange. The counterbore hole is painted white.
CAUTION : BE CAREFUL THAT THE FAN SPINNER DOES NOT FALL AND BECOME DAMAGED WHEN RELEASED FROM THE DISK.
(2)Remove the fan spinner and seal ring (Ref. 72-21-00, P. Block 801).
WARNING : MAKE SURE YOU USE GLOVES WHEN YOU TOUCH THE FAN BLADES. THIS WILL PREVENT INJURY TO THE HANDS.
CAUTION : WHEN YOU REMOVE ALL PARTS, EXCEPT BOLTS AND NUTS, TAG THE PARTS WITH A MATCHMARK. ASSEMBLE PARTS IN THE SEQUENCE REMOVED. MAKE A MARK WITH APPROVED MATERIAL ONLY. AN INCORRECT ALIGNMENT OF THE PARTS CAN CAUSE VIBRATION IN THE FAN ROTOR AND DAMAGE TO THE ENGINE.
(3)Use a felt-tip marker and identify the position numbers on the airfoils of the installed fan blades, 1-38. Position No. 1 is the second dovetail slot counterclockwise (CCW) of the spinner off-set hole in the disk post. It is identified with the No. 1. Blades are numbered CCW, forward, looking aft.
(4)Matchmark the stage 1 fan blades to the retainers and spacers. Matchmark the blades to the stage 1 rotor disk slots.
(5)Turn the rotor until the fan rotor blade (marked as No. 1), is at the 12 o'clock position before it is removed.
(6)Loosen the two blades adjacent to the damaged blade (marked as No. 38

and 2).

(7)Remove the bolts and balance weights, (if installed) from the blade No. 1 and the two adjacent blades No. 38 and 2.

(8)Write and record the position of the balance weights in relation to the blade positions.

(9)Put a load on the spacer with the tool 2C8073 and remove the key with the extractor MSE-54. Remove the tools.

(10)Hold the No. 1 blade radially out and remove the spacer and retainer from the blade. Again mark all parts in relation to the blade position.

CAUTION : MAKE SURE YOU DO NOT LET THE FAN BLADE HIT THE ABRADABLE SHROUD WHEN YOU REMOVE OR INSTALL THE FAN BLADES. IF THE BLADE HITS THE SHROUD, IT CAN CAUSE GOUGES, MARKS, OR GROOVES ON THE SHROUD. THIS CAN ALSO CAUSE POSSIBLE SHROUD EROSION.

(11)Move the No. 1 blade radially, as necessary to disengage the midspan shroud from the two adjacent blades.

Remove the blade from the disk dovetail slot and put it in a container.

R Post SB GE 72-1139

R (12)Remove the shim assembly from the blade dovetail or from the disk dovetail slot if the shim stays in the slot. It is necessary that you install a shim on the replacement blade.

R (13)Clean the shim assembly with Material No. C04.001 (Methyl-Ethyl-Ketone), C04-003 (Acetone), or C04-035 (Isopropyl Alcohol). Make sure that at least 50% molydag coating coverage remains on the shim assembly at each of the four pressure faces.

R (14)Examine the peek bumpers on the shim assembly for tears or if they are missing. If there is less than 50% molydag, or peek bumpers are torn or missing, the shim is not serviceable and you must replace it (Ref. Fig. 407).

R End Post SB GE 72-1139

R (15)Remove the two adjacent blades No. 38 and 2.

R (16)Remove the remaining 35 blades as in steps 4.B.(1) thru 4.B.(10).

C. Installation of All the Stage 1 Fan Blades

(1)Prepare to install all the stage 1 fan blades as follows :

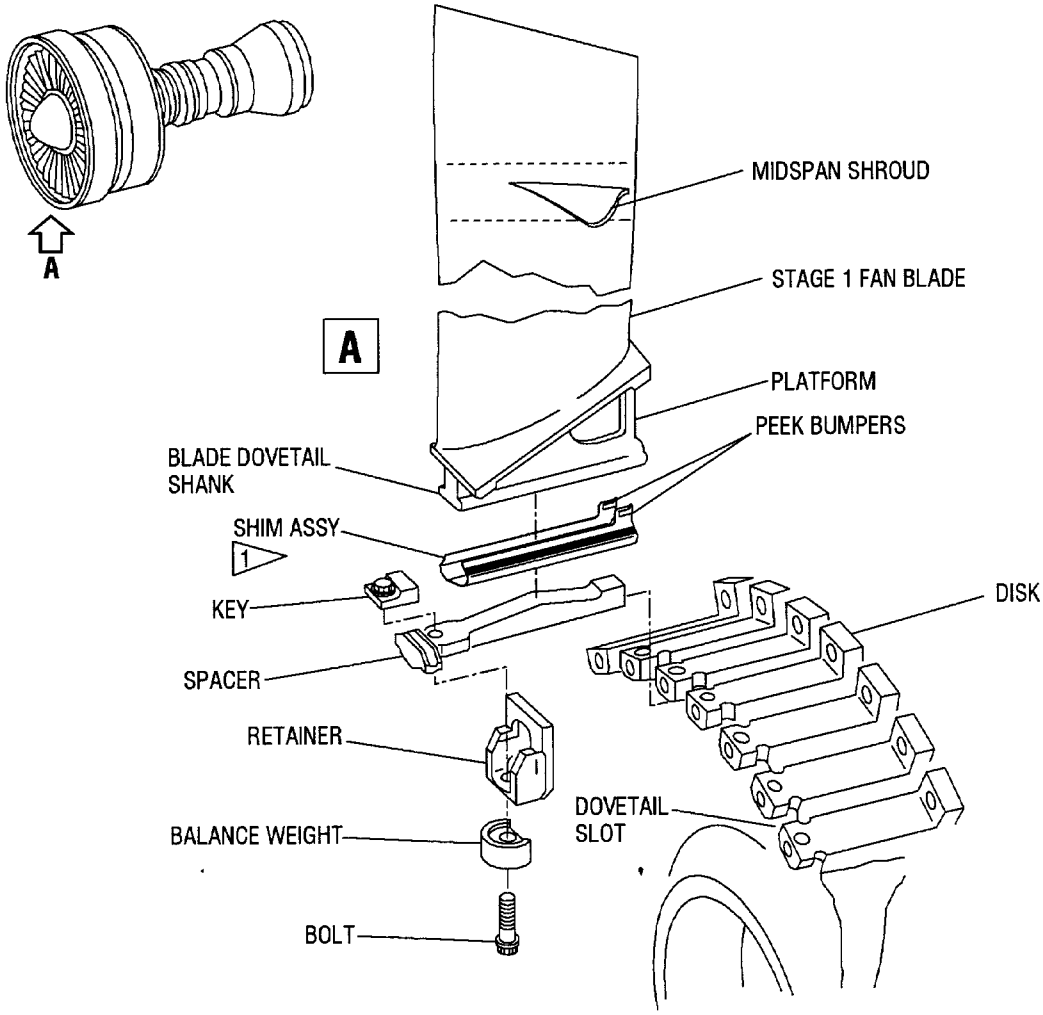
NOTE : If installing a set of blades that has been removed for normal maintenance and has been marked for location, then the moment weight plot is not necessary and blades are to be installed as marked.

NOTE : If a blade set that will include some or all replacement blades is ready for installation, discard all balance-weights (used on the damaged blades).

(a)Put the removed blades in sequence of moment-weight values that starts with the heaviest.

NOTE : Moment-weights are identified on the bottom of the blade dovetails. If you cannot read the moment-weights, the class codes are stamped on the top, forward surface of the blade platform.

(b)Write down the moment-weights, moment-weight class codes, and as-removed blade positions on the blade plot form. (Ref. Fig. 402, 403, 404)



1 NOTE: ON ENGINES WITH MODIFIED STAGE 1 FAN ROTOR DISK PER GE SB 72-1139 OR SIMILAR (TO USE SACRIFICIAL DOVETAIL SHIM ASSEMBLIES)THE STAGE 1 SPACER IS ALSO MODIFIED.

1240509-00

BM5 72 21 00 4 LAMD 01

R

Fan Blade - Removal/Installation
Figure 401

(Ref. Fig. 405, 406)

(c)Put the replacement blades in sequence by moment-weight values that start with the heaviest.

(d)Start with the heaviest blade in the set to be replaced. Write down its position number, found in step (a), on the heaviest blade of the set to be installed. Do the same with the next two heaviest blades in both sets and continue to number the remaining blades in the sets.

NOTE : For example the heaviest blade in the set needs replacement. It was from position "24" and was identified with "24". Use a felt-tip marker to identify the No. "24" on the heaviest blade in the replacement set. The second heaviest blade to be replaced was from position "5". It was identified with a "5". Use a felt-tip marker to identify the No. "5" on the second heaviest replacement blade.
Continue this procedure until all replacement blades have been numbered.

(e)Write down the moment-weights and moment-weight class code in their applicable positions on the blade plot form.

(f)Compare the total moment-weight effect in each quadrant of the rotor as follows :

1 Add the moment-weight in each quadrant and write down the total. Do this for both sets of blades.

2 Compare the totals of quadrant 1 (blade positions 1-10) to quadrant 3 (blade positions 20-29). Compare quadrant 2 (blade positions 11-19) to quadrant 4 (blade positions 30-38) for both sets.

3 Keep the quadrant total moment-weight differences (from one blade set to the other) to less than 100 grams.

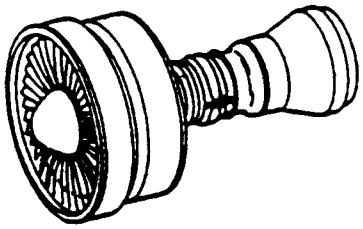
4 The smaller the difference of the totals (50 grams or less) is an indication that it is possible a trim balance is not necessary.

5 If the quadrant difference shows that a trim balance is necessary, it is possible to make the condition better. You can move the blades to different positions. In opposite quadrants, with the greatest total moment-weight difference, change unmatched blade pairs. These are blades with locations that are 180° apart. They must have a moment-weight of more than 50 grams or a class difference of more than one. This keeps the total difference to a minimum. Identify the blades to show their new position as necessary.
see (Ref. Fig. 402, 403) for more detail.

(2)Install all of the stage 1 fan blades as follows (Ref. Fig. 401) :

(a)Clean fan blade dovetails with Material No.C04-001, Material No.C04-003, or Material No.C04-035.

WARNING : MOLYKOTE D 321 R IS AN AGENT THAT IS FLAMMABLE, EXPLOSIVE AND AN IRRITANT. MAKE SURE THAT ALL PERSONS OBEY THE PRECAUTIONS WHEN MOLYKOTE D 321 R IS USED.
- GAS/AIR MIXTURES MORE THAN THE LOWER EXPLOSIVE LIMIT (LEL) CAN CAUSE AN EXPLOSION IF HIGH HEAT, SPARKS, OR FLAMES SUPPLY IGNITION.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET MOLYKOTE D 321 R IN YOUR EYES, ON YOUR SKIN,



ESN___		ORIGINAL BLADES		REPLACEMENT BLADES			ORIGINAL BLADES		REPLACEMENT BLADES			
	BLD POS	CL CODE	MOMENT WEIGHT	MOMENT WEIGHT	CL CODE		BLD POS	CL CODE	MOMENT WEIGHT	WEIGHT DIFF.	MOMENT WEIGHT	CL CODE
QUADRANT I	1					QUADRANT III	20					
	2						21					
	3						22					
	4						23					
	5						24					
	6						25					
	7						26					
	8						27					
	9						28					
	10						29					
QUADRANT II	11					QUADRANT IV	30					
	12						31					
	13						32					
	14						33					
	15						34					
	16						35					
	17						36					
	18						37					
	19						38					

BM5 72 21 00 4 LCMO - 00

Conversion Fan Blade Moment-Weight Plot Form
Figure 402

		ORIGINAL BLADES		REPLACEMENT BLADES			ORIGINAL BLADES			REPLACEMENT BLADES		
	BLD POS	CL CODE	MOMENT WEIGHT	MOMENT WEIGHT	CL CODE		BLD POS	CL CODE	MOMENT WEIGHT	WEIGHT DIFF.	MOMENT WEIGHT	CL CODE
QUADRANT I	1	140	179031	177181	177	QUADRANT III	20	140	179048	135 →	177316	174
	2	132	179424	177357	173		21	131	179484	629 →	177986	161
	3	121	179988	178303	154		22	119	180075	58 →	178361	153
	4	112	180443	178713	146		23	111	180476	713 →	179426	132
	5	109	180590	179622	128		24	110	180540	← 151	179471	131
	6	113	180383	178453	151		25	112	180447	330 →	178783	145
	7	122	179908	178236	156		26	123	179888	← 93	178143	158
	8	129	179565	178035	160		27	132	179439	← 183	177852	163
	9	147	178679	176991	181		28	148	178636	← 208	176783	185
	10	154	178315	176444	192		29	155	178293	← 64	176380	193
			1796326	1779335					1796326		1780501	
QUADRANT II	11	159	178077	176087	199	QUADRANT IV	30	160	178024	← 102	175985	201
	12	168	177602	175333	214		31	168	177633	320 →	175653	207
	13	173	177366	173971	241		32	187	176685	← 415	173556	249
	14	194	176344	173031	260		33	184	176818	641 →	173672	247
	15	181	176953	173812	244		34	183	176867	← 89	173723	246
	16	169	177575	174803	224		35	172	177436	← 672	174131	238
	17	164	177819	175840	204		36	161	177991	77 →	175917	202
	18	158	178115	176125	198		37	156	178224	118 →	176243	196
	19	152	178418	176537	190		38	150	178541	194 →	176731	186
			1598269	1575539					1598219		1575611	

ESN___

USE THE WEIGHT DIFFERENCE BETWEEN OPPOSITE REPLACEMENT BLADES. THIS WILL SIMPLIFY BLADES POSITION SWITCHING IF A QUADRANT BALANCE CHANGE IS REQUIRED.
← INDICATES LEFT QUADRANT HEAVIER → INDICATES RIGHT QUADRANT HEAVIER

BM5 72 21 00 4 LEM0 01

Conversion Fan Blade Moment-Weight Plot Form (Example)
Figure 403

	ORIGINAL BLADES	REPLACEMENT BLADES
TOTAL WEIGHT OF QUADRANT I	1796326	1779335
TOTAL WEIGHT OF QUADRANT III	1796326	1780501
Δ	0	1166
TOTAL WEIGHT OF QUADRANT II	1598269	1575539
TOTAL WEIGHT OF QUADRANT IV	1598219	1575611
Δ	50	72

REPLOT REPLACEMENT BLADES TO BALANCE QUDRANTS (AS REQUIRED)

QUADRANT	BLADES SWITCHED	WEIGHT DIFF. SWITCHED	NEW TOTAL WEIGHT
I	2 & 21	565	1779900
III	10 & 29		1779936
		Δ	36
II	15 & 34	29	1575568
IV	18 & 37		1575582
		Δ	14

THE QUADRANT I TO III WEIGHT DIFFERENCE IS TOO GREAT (1166) THUS A BLADE POSITION SWITCH IS INDICATED TO GET MORE WEIGHT INTO QUADRANT I.

SELECT BLADE(S) FROM THE MOMENT WEIGHT LISTING THAT WILL BRING THE QUADRANT WEIGHT DIFFERENCE AS CLOSE TO ZERO AS POSSIBLE (i.e. AS CLOSE TO THE ORIGINAL "Δ" AS POSSIBLE). A WAY TO ESTIMATE THE AMOUNT WEIGHT TO SWITCH IS AS FOLLOWS:

REPLACE BLADES WITH A "Δ" GREATER THAN ORIGINAL BLADES - SELECT BLADE(S) WHOSE WEIGHT DIFFERENCE WOULD BE EQUAL TO 1/2 OF REPLACEMENT BLADE/ORIGINAL BLADE WEIGHT DIFFERENCE.

ORIGINAL BLADES WITH A "Δ" GREATER THAN REPLACEMENT BLADES - SELECT BLADE(S) WHOSE WEIGHT DIFFERENCE WOULD BE EQUAL TO 2 TIMES THE REPLACEMENT BLADE/ORIGINAL BLADE WEIGHT DIFFERENCE.

THE TOTAL WEIGHT DIFFERENCE BETWEEN BLADES 2 AND 21 AND BETWEEN 10 AND 29 IS 565.

THE BLADES IN QUADRANT III (NUMBERS 21 AND 29) TOGETHER WEIGHTED MORE THAN THE BLADES IN QUADRANT I (NUMBERS 2 AND 10), THUS, SUBTRACT 565 FROM THE REPLACEMENT BLADE QUADRANT III TOTAL, ADD 565 TO THE REPLACEMENT BLADE QUADRANT I TOTAL, AND RECOMPUTE THEIR DIFFERENCE: 36. THIS IS AN ACCEPTABLE DIFFERENCE.

THE SAME LOGIC IS FOLLOWED FOR QUADRANT II TO IV.

BM5 72 21 00 4 LGMO - 00

Calculate Fan Blade Moment-Weight Plot Form (Example)
Figure 404

	ORIGINAL BLADES	REPLACEMENT BLADES
TOTAL WEIGHT OF QUADRANT I		
TOTAL WEIGHT OF QUADRANT III		
△	△	△
TOTAL WEIGHT OF QUADRANT II		
TOTAL WEIGHT OF QUADRANT IV		
△	△	△

REPLOT REPLACEMENT BLADES TO BALANCE QUDRANTS (AS REQUIRED)

QUADRANT	BLADES SWITCHED	WEIGHT DIFF. SWITCHED	NEW TOTAL WEIGHT
I			
III			
		△	
II			
IV			
		△	

BM5 72 21 00 4 LJMO - 00

Calculate Fan Blade Moment-Weight Plot Form
Figure 405

9319M30 WEIGHTS

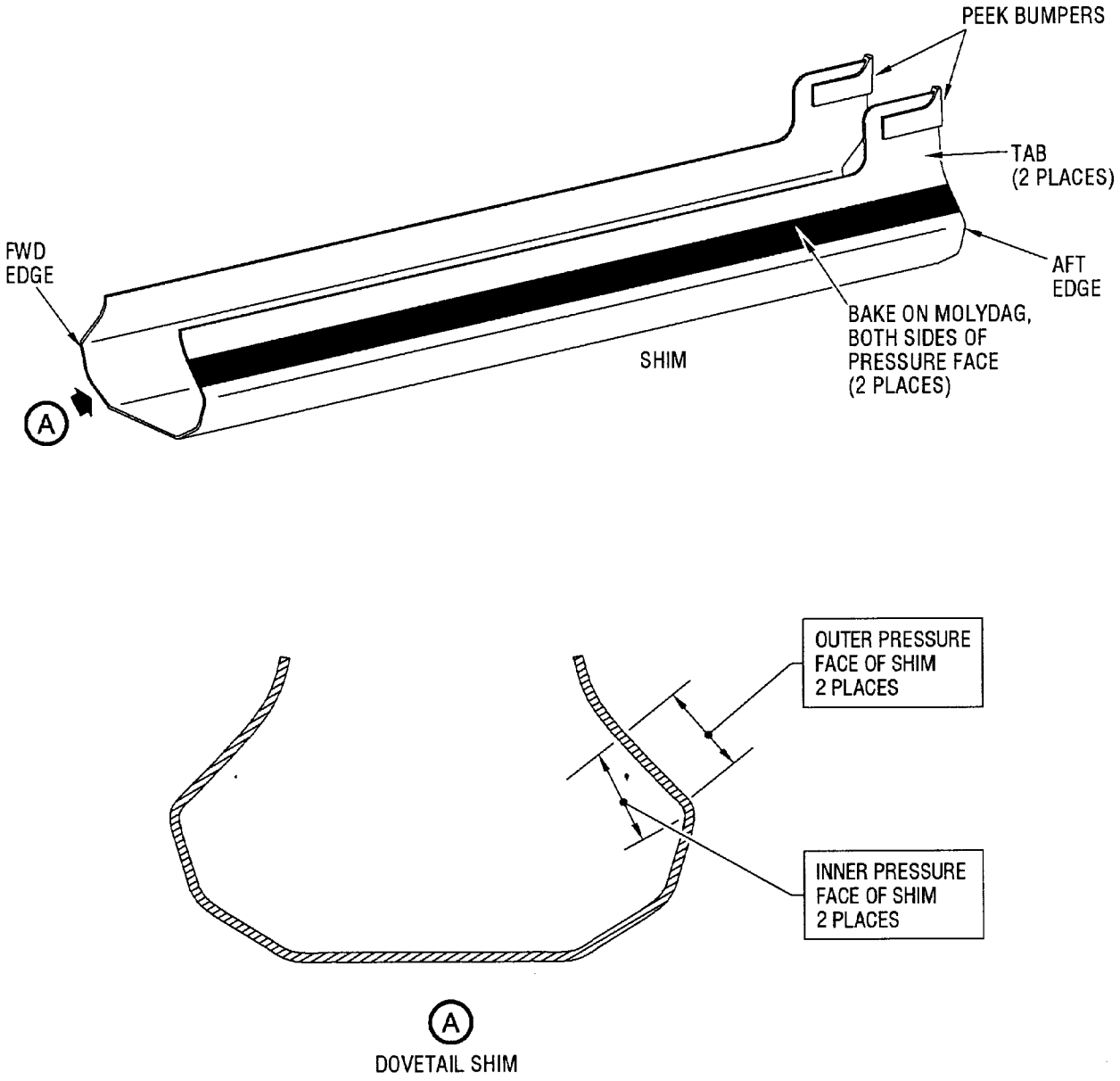
	GRAMS	APPROX GR-IN
P07	10	142
P08	20	279
P09	30	414
P10	40	547
P11	50	676
P12	60	804

NOTE:

INSTALLATION OF THESE BALANCE WEIGHTS IS PERMITTED UP TO A MAXIMUM WEIGHT LIMIT OF 300 GRAMS

BM5 72 21 00 4 LLMO - 00

Fan Rotor Blade Balance Weights
Figure 406



BM5 72 21 00 4 LSM0 00

R

Dovetail Shim
Figure 407

OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING : MOLYKOTE G-n PASTE IS AN AGENT THAT IS FLAMMABLE, EXPLOSIVE, AND AN IRRITANT. MAKE SURE THAT ALL PERSONS OBEY THE PRECAUTIONS WHEN MOLYKOTE G-n PASTE IS USED.
- GAS/AIR MIXTURES MORE THAN THE LOWER EXPLOSIVE LIMIT (LEL) CAN CAUSE AN EXPLOSION IF HIGH HEAT, SPARKS, OR FLAMES SUPPLY IGNITION.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET MOLYKOTE G-n PASTE IN YOUR EYES, ON YOUR SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING : REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIER'S MSDS FOR :
- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THESE HAZARDOUS AGENTS.

(b)Coat the following parts and areas with either the C02-078 (primary) or C02-003 (alternate) lubricant as specified.

1 Fan disk dovetail slots
- dovetail pressure faces, which contact with blade dovetail pressure faces
- exposed forward flange of the booster spool (or alternately coat aft face areas of the blade shank)
- slot bottoms
- aft lug ears of post (this area can touch fan blade).

2 Fan blade midspan shroud contact/mating surfaces.

3 Fan blade area below the platforms
- fan blade dovetail pressure faces (disk contact surfaces)
- blade shank fore and aft faces (or alternately the retainer and exposed forward flange of the booster spool).

4 Spacers, retainers and keys.

NOTE : The objective and intent of the lubricant application is to cover the blade-to-blade and blade-to-disk contact surfaces with a liberal amount of lubricant. Thickness values are not a requirement, but the application must cover required surfaces with a continuous, constant coating of lubricant as determined visually by the technician. There can be some material that will squeeze out and centrifuge outward ; however, an application that is not constant or is patchy (minimal) may not be effective. An application that is more than sufficient is better as long as it is not so much that it affects the rotor balance. Overcoat, oozing, centrifuging is permitted.

(c)Use of lubricant C02-078 Molykote G-n Paste (primary).

1 Apply Molykote G-n Paste (C02-078) manually from an uncontaminated container. Use a clean brush or gloved finger to apply to the

components. Install fan blade immediately in the fan disk position from which it was removed. Do not clean off contact surface (remove excess). After assembly, removal of squeeze-out, ooze, or excess is permitted. Do not put fan blade on any surface after lubricant has been applied. Contamination of lubricant can occur. Use the same procedure for all parts that require lubrication. The use of this paste (grease-like) lubricant does not require drying time or curing time and assembly can immediately follow application.

WARNING: DO NOT TRY TO DRY OR CURE BY USE OF A HEAT GUN. HIGH TEMPERATURE OR HOT AIR WILL REMOVE THE MINERAL OIL AND WAXES IN THE PRODUCT, CAUSE FLAKING OR POWDERING AND SIGNIFICANTLY REDUCE LUBRICANT ADHERENCE AND PERFORMANCE.

(d)Use of lubricant C02-003 Molykote D 321 R (alternate).

1 Apply two coats of lubricant. Let each coat air dry at 73°F (23°C) for 5 to 15 minutes (longer in cold and/or humid environments). The recommended/optimal spray standoff distance is 12 to 15 in. (305 to 381 mm). Overspray of this lubricant is permitted. Wet lubricant can act as glue and hold the fan blade in a position which does not agree with that of the original fan balance. This can cause a shift in fan balance. Do not install the blades in the disk until the two coats of lubricant have dried.

WARNING : LUBRICATING OIL IS AN AGENT THAT IS AN IRRITANT. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN LUBRICATING OIL IS USED.
- DO NOT USED IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET LUBRICATING OIL IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE MIST.

WARNING : REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIER'S MSDS FOR :
- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

(e)Apply Material No.C02-019 to the threads of the bolts.

(f)Install the No. 1 stage 1 fan blade as follows :

NOTE : Forward-looking-aft, the No. 1 blade is the second blade CCW from the off-set hole. The No. 1 blade slot is identified 1-1 on the disk.

CAUTION : MAKE SURE YOU DO NOT LET THE FAN BLADE HIT THE ABRADABLE SHROUD WHEN YOU REMOVE OR INSTALL THE FAN BLADES. IF THE BLADE HITS THE SHROUD, IT CAN CAUSE GOUGES, MARKS, OR GROOVES ON THE SHROUD. THIS CAN ALSO CAUSE POSSIBLE SHROUD EROSION.

1 Install the fan blade identified as No. 1, to the slot in the stage 1 disk that is identified as No. 1.

2 Hold fan blade outward, install retainer, then install the spacer

through the retainer.

3 Put a load to spacer with the tool 2C8073, and then install the key.

NOTE : Discard the old balance-weights of damaged blade if replacement blades are installed.

4 Remove the tool 2C8073.

5 Install all the balance-weights if they were removed from the blade. Attach the assembly together with a bolt. TORQUE the bolt to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN).

NOTE : Install balance-weights if no replacement blades are installed.

(g)Install the remaining 37 stage 1 fan blades. Refer to steps (2)(d)1 to (2)(d)2.

1 Do a visual inspection of the fan blades. Make sure they are in the correct slots.

(3)(Optional procedure) Apply sealant between the blade dovetail slots (Ref. 72-21-00, P. Block 801).

(4)Measure the stage 1 fan blade tip-to-shroud clearances as follows : (Ref. Fig. 408, 409)

NOTE : It is not necessary to measure the average tip-to-shroud clearance if 10 or less stage 1 fan blades are replaced.

CAUTION : MAKE SURE ALL THE BLADES, RETAINERS, AND SPACERS ARE INSTALLED CORRECTLY BEFORE YOU MEASURE THE BLADE TIP-TO-SHROUD CLEARANCE. THIS WILL GIVE ACCURATE CLEARANCES AND PREVENT DAMAGE TO THE BLADES.

(a)Make an axial reference line at the 6 o'clock position on the inside of the abradable shroud. Use a felt-tip pen or an equivalent.

NOTE : Use the split line in the acoustical liner, as one more axial reference line at the 6 o'clock position.

(b)Measure aft from the face of the forward flange of the forward fan case 10.4 in. (264 mm) to mark the E12 position.

(c)Measure aft from the face of the forward flange of the forward fan case 13.4 in. (340 mm) to mark the E13 position.

(d)Make one circumferential line at the E12 position and make the other circumferencial line at the E13 position.
Make each line about 3.0 in. (76 mm) long.

NOTE : Use a felt-tip pen or equivalent to mark the lines on the abradable shroud.

(e)If necessary make a mark and identify the fan blades with numbers 1 through 38, starting at the 12 o'clock position in a counterclockwise direction.

NOTE : The number on the fan blade will help to identify the tip clearance data for each blade.

(f)Hold the blade outboard of the midspan shroud. Shake each blade forward and aft with much force.

NOTE : This will make sure the blade is engaged in the dovetail slot for accurate dimensions measured.

(g)Turn the rotor then measure and write down the E12 and the E13 clearance dimension of each blade at the 6 o'clock position as follows :

1 Pull the blade tip forward as far as it will go and then release it.

2 Measure and write down the clearance data between the tip of the

blades and the shroud at the E12 position. Use a feeler gage or equivalent to measure the blade tip-to-shroud clearance.

3 Measure and write down the clearance data between the tip of the blades and the shroud at the E13 position. Use a feeler gage or equivalent to measure the blade tip-to-shroud clearance.

(h)Examine the abradable shroud to see if a step has rubbed into its surface by the leading edge of the fan blade.
If there is a step, make sure that the forward end of the feeler gage is aft of the step when E12 is measured. Write down the results and dimension of all step conditions.

(i)Examine the abradable shroud to see if a step has been rubbed into its surface by the trailing edge of the fan blade.
If there is a step, make sure that the aft end of the feeler gage is forward of the step when E13 is measured. Write down the results and dimension of all step conditions.

(j)Remove the feeler gage from the 6 o'clock position on the shroud.

(k)Use the tip-to-shroud data to calculate the clearance dimensions as follows :

1 Add all 38 measurements taken at E12 and divide by 38.
NOTE : The E12 calculated average measurement must not be more than 0.198 in. (5.03 mm) and not less than 0.115 in. (2.92 mm).

2 Add all 38 measurements taken at E13 and divide by 38.
NOTE : The E13 calculated average measurement must not be more than 0.236 in. (5.99 mm) and must not be less than 0.156 in. (3.96 mm).

(l)Sand the forward and aft edges of all step conditions to make the aerodynamic surface smooth on the abradable shroud.
NOTE : Do not sand the rubbed area.

(m)Sand and remove the abradable shroud material with 120-180 grit sandpaper, for added clearance if necessary.

(n)Add abradable material to the shroud (build-up the shroud) to decrease clearance if necessary (Ref. 72-23-00, P. Block 801).

(o)Examine the runout of the abradable shroud at E12 as follows :

1 Install a dial indicator and runout fixture, (2C14772) at the 6 o'clock position and set the indicator to zero.
Runout no less than or equal to 0.10 in. (2.5 mm). If the runout is more than the limits, do as follows :

2 Add abradable material to the shroud (build-up the shroud) to decrease clearance if runout is not within limits given (Ref. 72-23-00, P. Block 801).

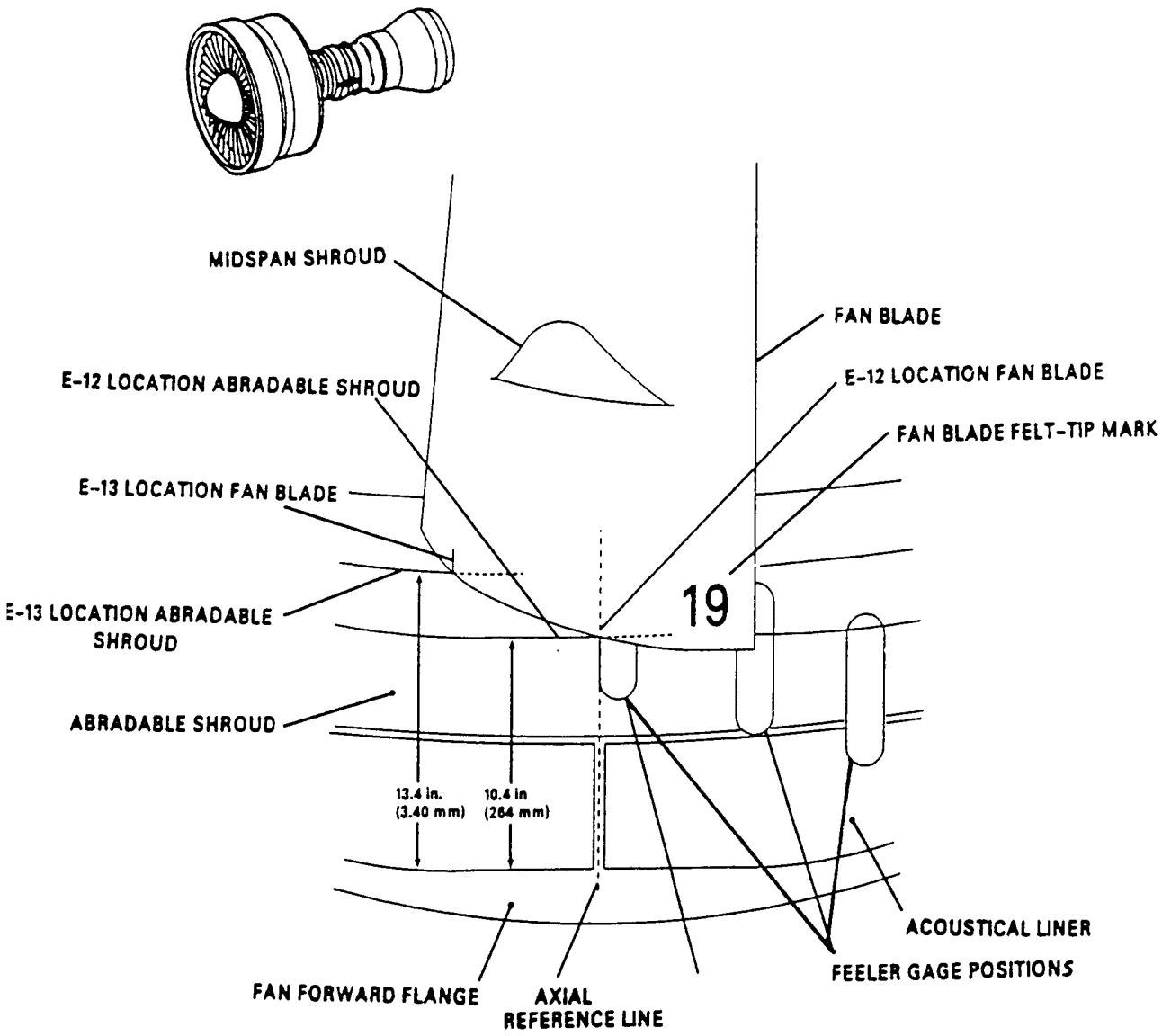
3 Examine again the runout of the abradable shroud.
Runout must be less than or equal to 0.10 in. (2.5 mm).
NOTE : Do the procedures again until the tip-to-shroud clearance is in the limits given.

(5)Install the fan spinner (Ref. 72-21-00, P. Block 801).

D. Close-Up

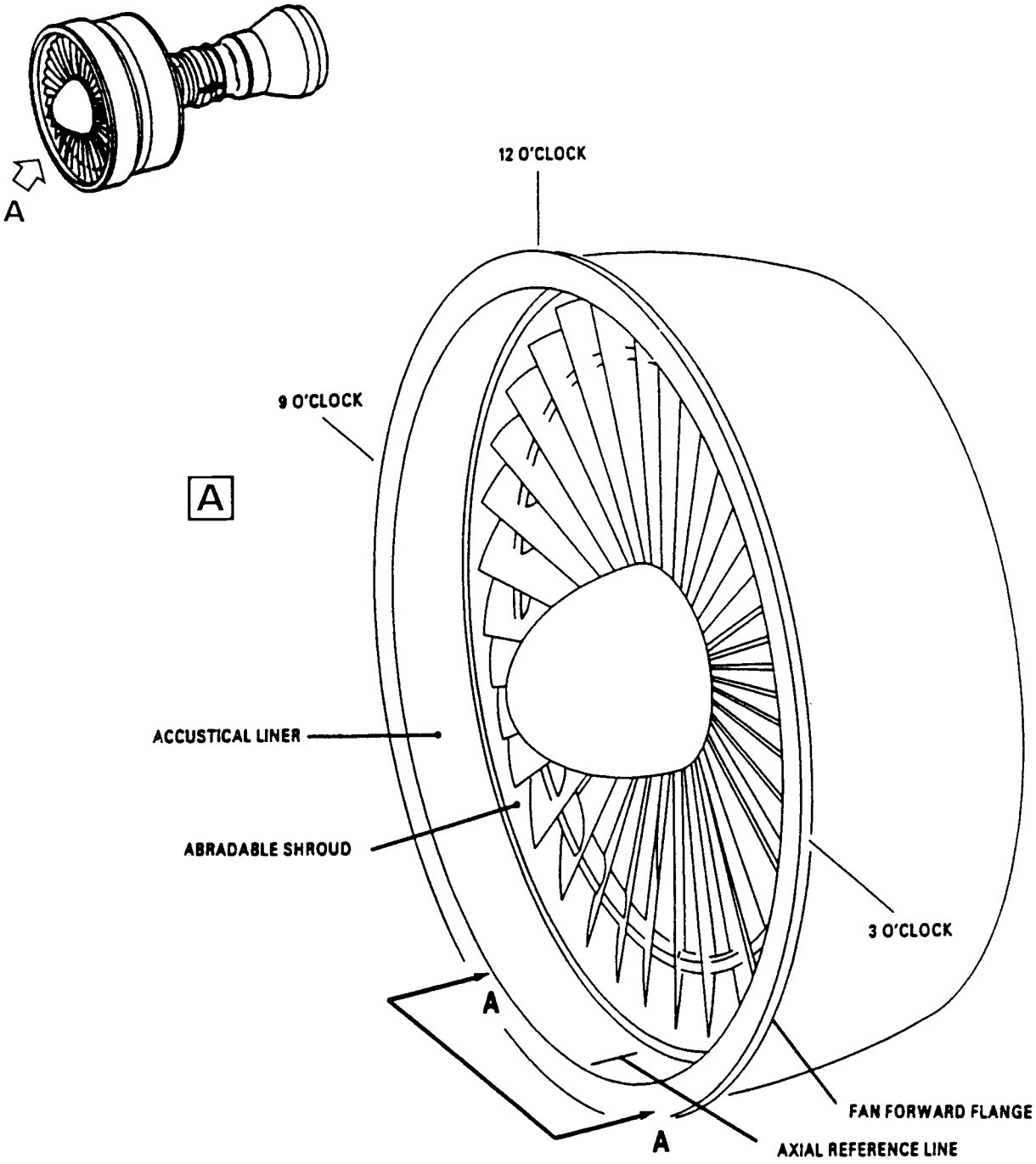
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(2)Remove access platform.



BM5 72 21 00 4 LNMO - 00

Stage 1 Fan Blade Clearance Inspection/Check
Figure 408



Stage 1 Fan Blade Clearance Inspection/Check
Figure 409

(3)Remove safety clips and tags and close circuit breakers.

FAN ROTOR ASSEMBLY - INSPECTION/CHECK

1. General

A. This section gives information on the methods of inspecting the fan rotor assembly.

B. Maintenance of the fan rotor assembly is limited to external areas. If this inspection is required, removal of the fan blades is normally not required. The inspection is limited to those areas of the blade that are accessible.

C. Stage 1 fan blades may be manufactured with or without squealer tips. The two types are interchangeable and may be installed in any combination.

2. Equipment and Materials

ITEM	DESIGNATION
A. 2C6894	Tool, Removal - Fan Spinner
B. 2C8073	Fixture, Stage One Fan Blade Preload - Spacer
C.	Torque Wrench 300 - 320 lbf. in. (3.39 - 3.61 m.daN)
D. Material No.C02-003	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
E. Material No.C02-078	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
Referenced Procedures	
- 71-00-00, P. Block 401	Power Plant - General
- 72-21-00, P. Block 401	Fan Rotor Assembly
- 72-21-00, P. Block 801	Fan Rotor Assembly
- 72-21-01, P. Block 401	No. 1 Bearing Manifold

3. Procedure

CAUTION : DO NOT PROCESS TITANIUM PARTS IN COMPOUNDS THAT CONTAIN HALOGEN.

A. If necessary, remove the fan spinner for inspection (Ref. 72-21-00, P. Block 801).
NOTE : It is usually not necessary to remove the fan spinner for inspection.

B. If necessary, remove the fan blades for inspection (Ref. 72-21-00, P. Block 401).
NOTE : It is usually not necessary to remove the fan blades for inspection.

C. Do a visual inspection of the fan rotor assembly for the conditions that follow. Make certain that all cracks are checked by spot fluorescent-penetrant-inspection.
(1)Not applicable.

(2)Spinner for :

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(a)Cracks	Not serviceable	Replace spinner (Ref. 72-21-00, P. Block 401)
(b)Nicks and scratches	Any number 0.030 in. (0.76 mm) deep with a minimum separation of 1.0 in. (25 mm)	Replace spinner (Ref. 72-21-00, P. Block 401)
(c)Dents	Any number 0.125 in. (3.18 mm) deep	Replace spinner (Ref. 72-21-00,P. Block 801)
(d)Erosion (Missing anodize coating)	Permitted	
(e)Broken or cracked rabbet tabs	Not repairable	Replace spinner (Ref. 72-21-00, P. Block 401)
(f)Fuel-Oil Leakage	Not permitted	Remove the engine (Ref. 71-00-00, P. Block 401) and inspect the HPC rotor bore for fuel-in-oil contamination at shop level.
(g)Oil Leakage	Not permitted	Remove and replace preformed packings on No. 1 bearing manifold (Ref. 72-21-01, P. Block 401).

(3)Stage 1 Disk for :

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(a)Cracks	Not serviceable	
(b)Nicks and scratches (except on dovetail slots, disk bore, bore faces, and aft side of web)	Any number 0.010 in. (0.25 mm) deep after removal of high metal.	
(c)Nicks and scratches	Any number 0.003 inch	

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
on dovetail slots disk bore, bore faces, and aft side of web	(0.08 mm) deep	
(d)Wear of Cu-Ni-Indium in dovetail slot and slot bottom	75% of total area must be coated. No fretting of base metal allowed	
(e)Missing Molydag coating on dovetail pressure faces	Permitted	Clean and recoat surface with a liberal amount of C02-078 or C02-003 to prior reassembly.
(f)Missing sealant any amount at blade retainer locations	Permitted	
(g)All or some of the aft dovetail slot seals are missing	There is no limit on the number of dovetail slot seals missing	

(4)Stage 1 Fan Blades for : (Ref. Fig. 601)

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(a)Cracks or tears		
1 Operational cracks	Not serviceable	Replace blade (Ref. 72-21-00, P. Block 401).
2 FOD caused cracks or tears	Not serviceable	Blend damaged area (Ref. 72-21-00, P. Block 801). Until all indications are removed. Spot fluorescent-penetrant-inspect to assure that all indications are removed. Total blend cannot exceed max repair Limits as defined in figure.
(b)Nicks, dents and scratches on contour	Any number 0.003 in. (0.08 mm) deep	Replace blade (Ref. 72-21-00,

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
surfaces of area A, area C and root area.		P. Block 401).
(c)Nicks, dents and scratches on leading and trailing edges of area A, area C and root area.	Any number 0.020 in. (0.51 mm) deep	Blend (Ref. 72-21-00, P. Block 801)
(d)Nicks, dents and scratches on leading or trailing edges in all areas except area A and area C.	Any number 0.060 in. (1.52 mm) deep in outer panel and/or any number 0.040 in. (1.02 mm) deep in inner panel and 0.5 in. (13 mm) long for scratches, after removal of high metal	Blend (Ref. 72-21-00, P. Block 801).
(e)Blade tip for : 1 Tip curl	Both corners on each blade tip may exhibit tip curl provided tip curl does not extend across more than 0.5 in. (13 mm) of leading or trailing edge of blade tip and deflection from original contour must not exceed 0.25 in. (6.4 mm). A maximum of 5 blades may have tip curl at one corner extending up to 1.5 in. (38 mm) across blade tip, leading or trailing edge, and deflection from original contour must not exceed 0.300 in. (7.62 mm).	Blend (Ref. 72-21-00, P. Block 801).
2 Nicks and dents	Any amount 0.060 in. (1.52 mm) deep, 0.250 in. (6.35 mm) long	Reform (cold work) to original profile. Blend as required (Ref. 72-21-00, P. Block 801). Spot fluorescent-penetrant-inspect
(f)Nicks, dents and scratches on contour surfaces	Any number 0.020 in. (0.51 mm) deep, 0.5 in. (13 mm) long ; no diametral limit for nicks and dents, after removal of high metal	Blend (Ref. 72-21-00, P. Block 801)

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(g)Nicks, dents and scratches on top surface of blade platform (excluding fillet)	Any number 0.030 in. (0.76 mm) deep, 0.5 in. (13 mm) long for scratches, no limit on diameter for nicks and dents, after removal of high metal	Blend (Ref. 72-21-00, P. Block 801).
(h)Missing Molydag coating on dovetail pressure faces	50% of total area must be coated	Replace blade (Ref. 72-21-00, P. Block 401).
(i)Wear of Cu-Ni-Indium coating on dovetail	75% of area must be coated. No sign of fretting on base metal permitted	Replace blade (Ref. 72-21-00, P. Block 401).
(j)Pits	No maximum limit if not more than 0.005 in. (0.13 mm) deep, no limit on diameter or spacing	Replace blade (Ref. 72-21-00, P. Block 401)
(k)Nicks, dents and scratches on mid-span shroud	No maximum limit if not more than 0.010 in. (0.25 mm) deep, any length for scratches and 0.5 in. (13 mm) diameter for dents. No permitted on hard coat surface.	Blend (Ref. 72-21-00, P. Block 801)
(l)Pitting, wear or hard coat that is gone from mid-span shroud	No visible sign of wear extending through hard coat, 10% of surface can be flaked off. No cracking or crazing permitted	Replace blade (Ref. 72-21-00, P. Block 401)
(m)Nicks, dents and scratches in dove-tail fillet radius	Not serviceable	Replace blade (Ref. 72-21-00, P. Block 401)
(n)Fretting on :		
1 Aft side of shank	No maximum limit if not more than 0.003 in. (0.08 mm) deep	Replace blade (Ref. 72-21-00, P. Block 401)
2 Forward face of dovetail	No maximum limit if not more than 0.003 in. (0.08 mm) deep	Replace blade (Ref. 72-21-00, P. Block 401)
3 Side edges of platform	No maximum limit if not more than 0.015 in. (0.38 mm) deep	Replace blade (Ref. 72-21-00, P. Block 401)

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(o)Leading edge distortion in area B and D (from FOD)	Two areas may have distortion of 0.50 in. (13 mm) from the initial contour if there are no sharp corners and a minimum length of the distortion is six times the width.	Spot fluorescent-penetrant-inspect
(p)Leading edge distortion in area C (from FOD)	May have distortion of 0.125 in. (3.17 mm) from the initial contour if there are no sharp corners and minimum length of distortion is six times the width	Do a spot fluorescent-penetrant-inspection
(q)Fan blade trailing edge tip seizure in fan case shroud	Any number, any degree of seizure if blade(s) meet the other inspection conditions in paragraph 3.A.	Repair or replace (Ref. 72-21-00, P. Block 401 and 801)
(r)Discoloration resulting from tip rub in fan case shroud	Any amount provided there are no cracks in the airfoil	
(s)Dovetail/platform seals for : 1 Damaged or missing seal	Any amount missing	Local build up with RTV 109 or Repair seal (Ref. 72-21-00, P. Block 801)

(5)Stages 2, 3, 4 and 5 Blades for : (Ref. Fig. 601)

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(a)Airfoil distress	No maximum limit if not more than 0.015 in. (0.38 mm) deep in root area A No maximum limit if not more than 0.060 in. (1.52 mm) deep in area B	Refer to Over-Serviceable Limit - Extensions, (Ref. 72-00-00, P. Block 601)

(6)Stage 1 Fan Rotor Blade Retainers

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(a)Damaged or missing rubber seal	Any amount missing	Repair (Ref. 72-21-00, P. Block 801)

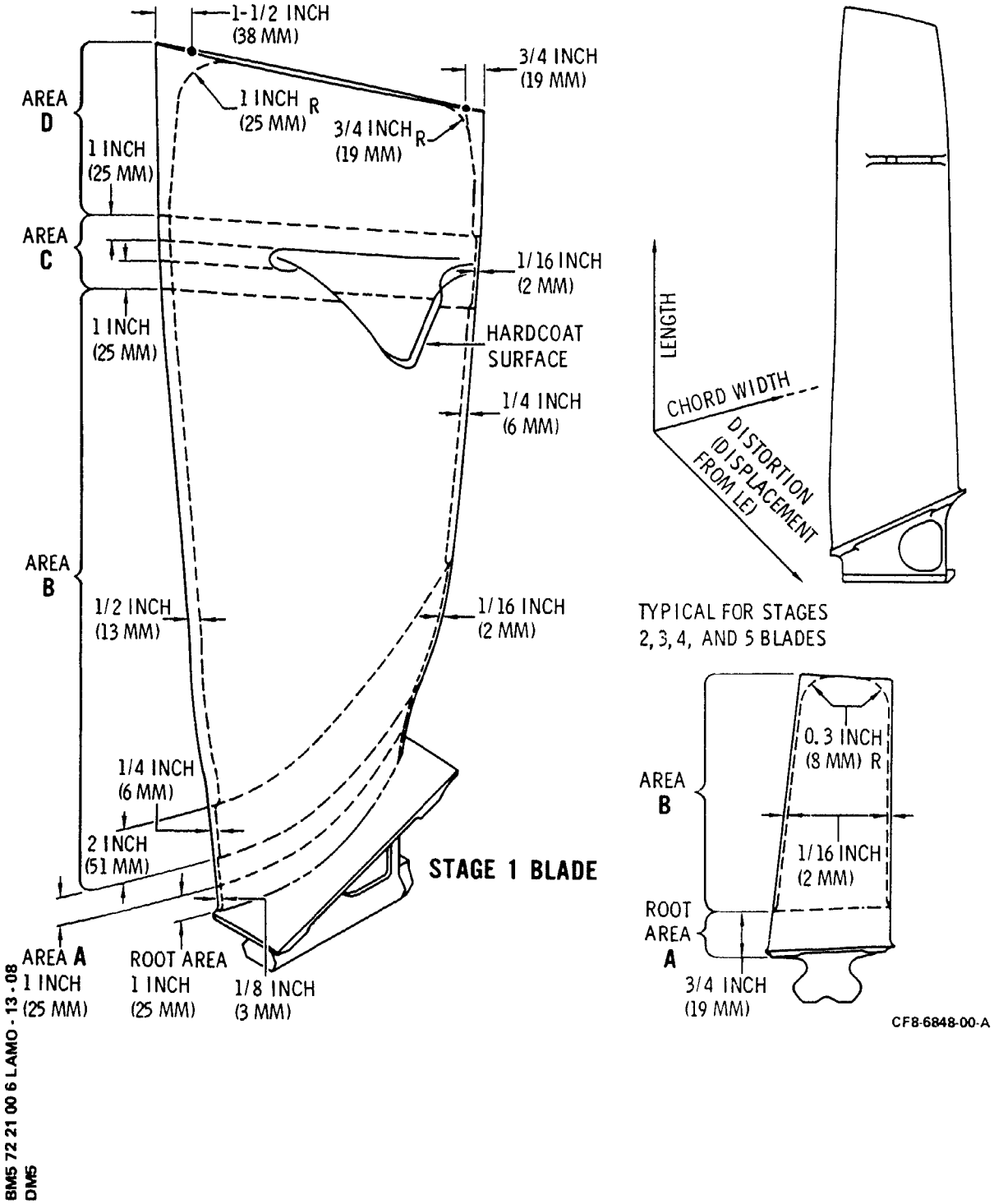
(7)Stage 1 Fan Dovetail Shim Assembly (Ref. Fig. 602)

NOTE : The following part is present only if the stage 1 Fan disk has been modified per GE SB 72-1139 or a similar repair document to accept these sacrificial shims.

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(a)Missing molydag coating on dovetail pressure faces inside or outside	Up to 50% of the molydag on each of the four (2 inside and 2 outside of shim) dovetail pressure faces may be missing or damaged	Replace shim
(b)Peek bumper is missing or torn	Not serviceable	Replace shim
(c)Peek bumper is dented	Any amount	

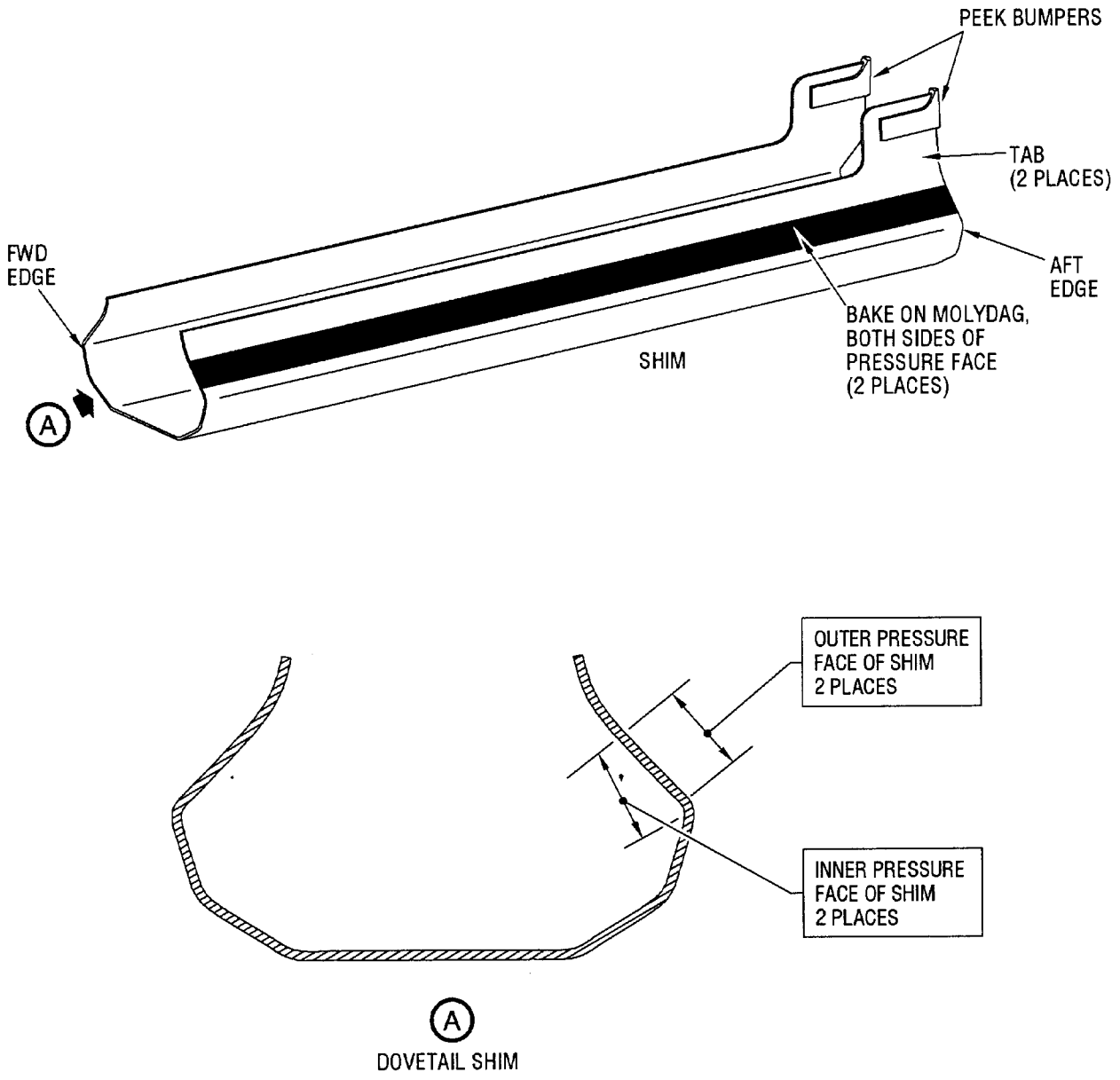
D. If necessary, install the fan blades (Ref. 72-21-00, P. Block 401).

E. If necessary, install the fan spinner (Ref. 72-21-00, P. Block 801).



BM5 72 21 00 6 LAMO - 13 - 08
DM5

Stages 1-5 Fan Rotor Blades - Blend Limits
Figure 601



BM5 72 21 00 6 LCM0 00

Dovetail Shim
Figure 602

FAN ROTOR ASSEMBLY - APPROVED REPAIRS

1. General

A. Instructions are given in these procedures to repair or replace defective parts of the fan rotor assembly on an installed engine.

B. Any usable parts removed should be matchmarked or numbered to ensure correct reassembly.

C. Stage 1 Fan Blades may be manufactured with or without squealer tips. The two types are interchangeable and may be installed in any combination.
CAUTION : DURING ENGINE SHUTDOWN THE BYPASS VALVES ARE IN THE OPEN POSITION. TAKE PRECAUTIONS WHEN WORKING IN THE FAN AREA TO PREVENT OBJECTS FROM FALLING THROUGH THE VALVE OPENINGS INTO THE FAN FRAME INTERNAL CAVITY.

2. Blending of First Stage Fan Blades (Ref. Fig. 801)

A. Equipment and Materials

ITEM	DESIGNATION
(1)2C14728	Template, Leading Edge Contour - Stage 1 Fan Rotor Blades
(2)Material No.C02-004	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
Referenced Procedures	
- 72-00-00, P. Block 501	Engine - General

B. Blending
CAUTION : POWER BLENDING MUST BE ACCOMPLISHED IN SUCH A MANNER THAT NO EXCESSIVE HEAT AND THERMAL STRESSES WILL BE GENERATED.
(1)Blending may be accomplished by using a fine file, abrasive cloth, or abrasive stone. If a large or deep blend is required, a slow-speed power tool may be used to shorten the time required to remove the metal but a fine finish must be applied (equivalent to original finish) by hand blending.
(2)Blending and polishing must be done in a longitudinal direction parallel with the length of the blades. The leading and trailing edge radius of the blend repaired area must conform to the original contour. (Ref. Fig. 806)
Template, 2C14728G01, may be used to check leading edge blend contour.
NOTE : You can use template 2C14728G01 to check leading edge blend contour. This tool has a line scribed on it that shows Engine Manual blend limits. The AMM blending limits allow for approximately 0.250 in. (6.35 mm) more material to be removed (Ref. Fig. 801).
NOTE : Blending of the outer panel to the maximum blend limits

(Ref. Fig. 801) can influence the moment weight by as much as 100 gram-inches or 2 weight classes. (Ref. Fig. 803, 804, 805).

(3)If you think the fan is not balanced because of maintenance actions, you can do the vibration survey.

(a)Do the vibration survey (Ref. 72-00-00, P. Block 501).

(b)TORQUE the spinner bolts again to between 300 and 320 lbf.in. (3.39 and 3.61 m.daN).

(4)When blending an area involving a radius, maintain radius as specified or as near as possible to original radius and the finish on blended areas must be as close as practical to the original finish.

(5)On leading and trailing edges remove material a minimum of 0.030 in. (0.76 mm) below the defect.

CAUTION : DO NOT PROCESS TITANIUM PARTS IN HALOGEN-CONTAINING COMPOUNDS.

(6)After fan blade blending, perform a spot fluorescent-penetrant inspection on the blended area. If no FPI capability exists :

CAUTION : IF YOU USE RED DYE, THE FPI MAY NOT BE SUFFICIENT.

(a)After rework, use white light and magnify 10X or greater to inspect the blended area. No cracks are permitted.

(b)Identify the blades with an approved black marker to show the blended area and the date of the blending. Give instructions to the personnel to schedule FPI.

(c)Complete FPI at an approved station at 10 cycles or within 50 flight hours.

3. Replacement of Fan Spinner (Ref. Fig. 802)

A. Equipment and Materials

ITEM	DESIGNATION
(1)2C6894	Tool, Removal - Fan Spinner
(2)2C6920	Pin, Guide - Fan Desk, Stage 1
(3)	Torque Wrench 300-320 lbf.in. (3.39 - 3.62 m.daN)
(4)Material No.C02-008	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
(5)Material No.C02-019	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
(6)Material No.C02-033	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
Referenced Procedure - 72-00-00, P. Block 501	Engine - General

B. Replacement

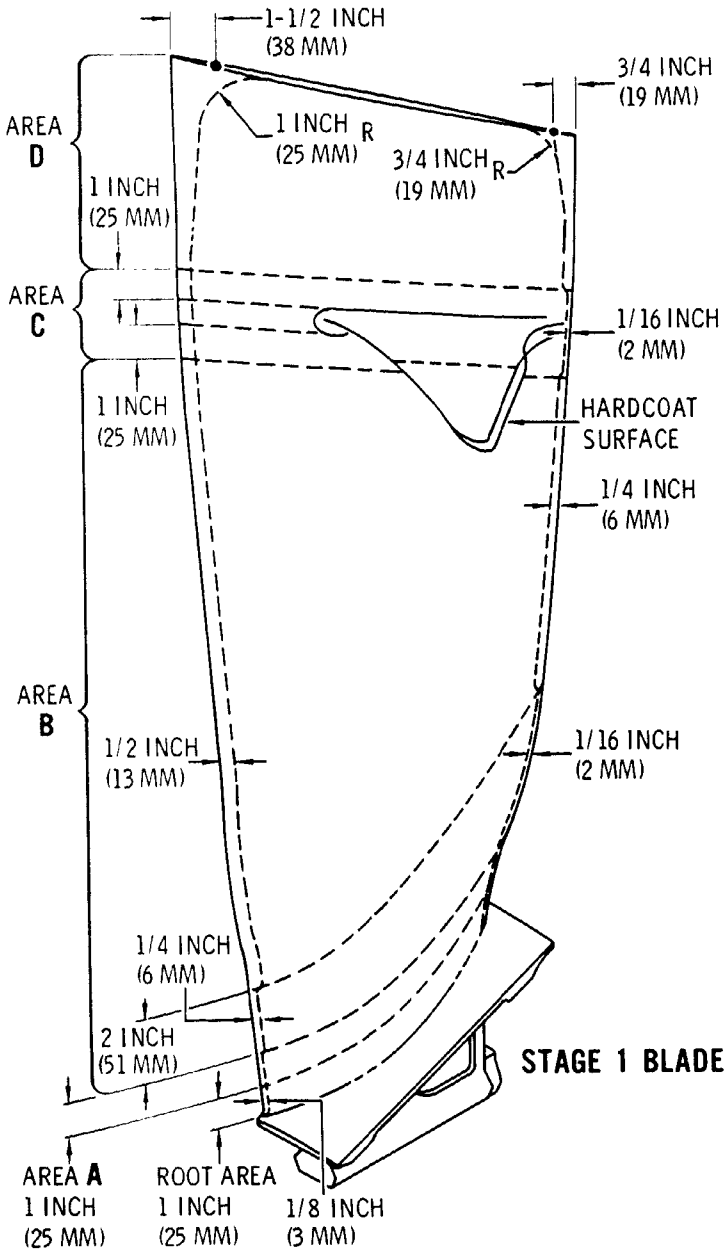
(1)Matchmark fan spinner to stage 1 rotor disk.

(2)Loosen and remove 38 bolts and washers securing spinner to stage 1 rotor disk.

(3)Remove spinner using tool, 2C6894G04.

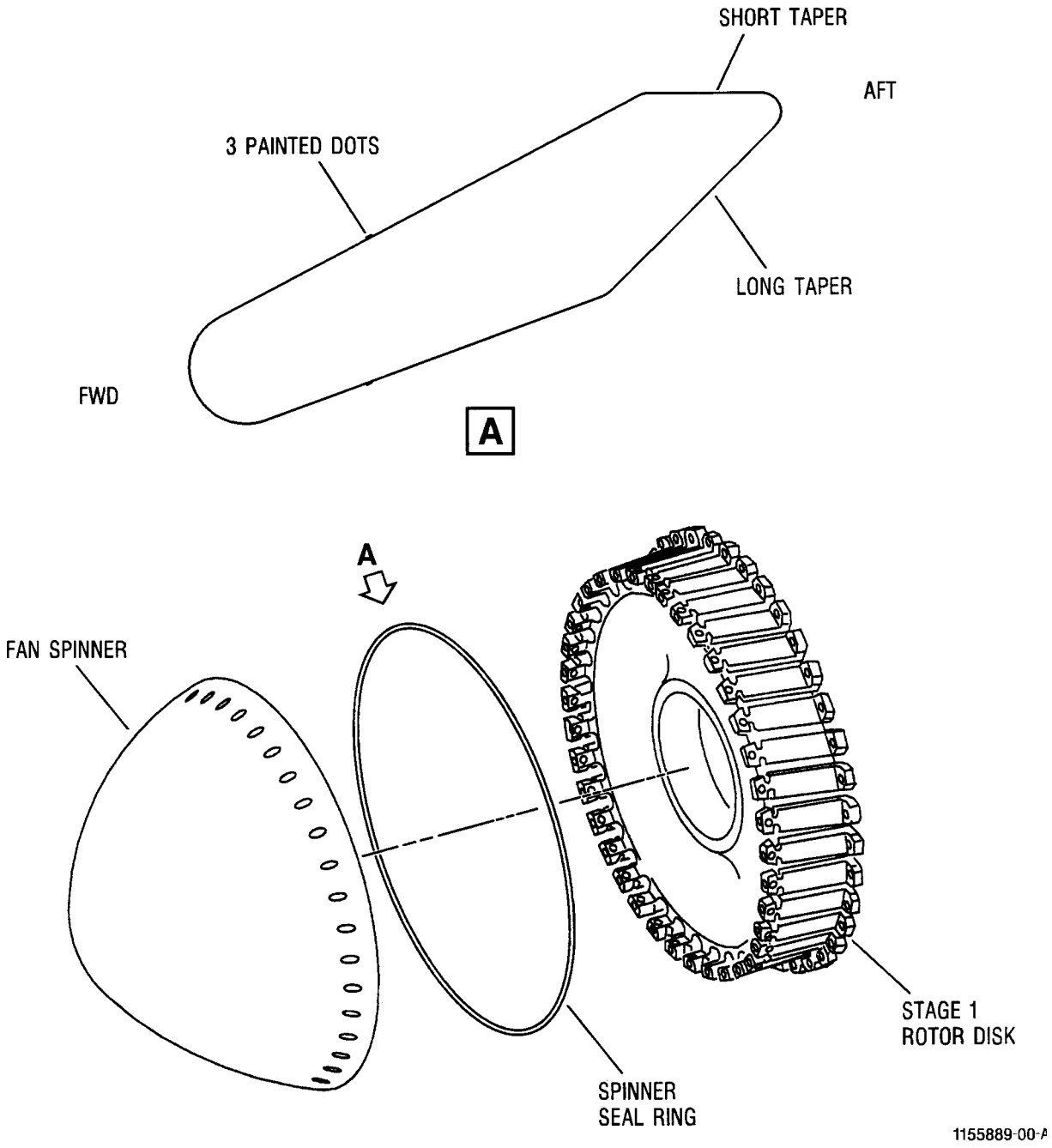
(4)Transfer matchmark to replacement spinner.

(5)Transfer any trim balance weights to the identical locations on the replacement spinner.



BM5 72 21 00 8 LGMO - 13 - 08
DM5

Stage 1 Fan Rotor Blade - Blend Limits
Figure 801



BM5 72 21 00 8 LAMO 00

Fan Spinner Seal Ring Installation
Figure 802

MOMENT WEIGHT IN GRAM-INCHES	CLASS NO.	MOMENT WEIGHT IN GRAM-INCHES	CLASS NO.	MOMENT WEIGHT IN GRAM-INCHES	CLASS NO.	MOMENT WEIGHT IN GRAM-INCHES	CLASS NO.
186, 000 185, 951	1	185, 100 185, 051	19	184, 200 184, 151	37	183, 300 183, 251	55
185, 950 185, 901	2	185, 050 185, 001	20	184, 150 184, 101	38	183, 250 183, 201	56
185, 900 185, 851	3	185, 000 184, 951	21	184, 100 184, 051	39	183, 200 183, 151	57
185, 851 185, 801	4	184, 950 184, 901	22	184, 050 184, 001	40	183, 150 183, 101	58
185, 800 185, 751	5	184, 900 184, 851	23	184, 000 183, 951	41	183, 100 183, 051	59
185, 750 185, 701	6	184, 850 184, 801	24	183, 950 183, 901	42	183, 050 183, 001	60
185, 700 185, 651	7	184, 800 184, 751	25	183, 900 183, 851	43	183, 000 182, 951	61
185, 650 185, 601	8	184, 750 184, 701	26	183, 850 183, 801	44	182, 950 182, 901	62
185, 600 185, 551	9	184, 700 184, 651	27	183, 800 183, 751	45	182, 900 182, 851	63
185, 550 185, 501	10	184, 650 184, 601	28	183, 750 183, 701	46	182, 850 182, 801	64
185, 500 185, 451	11	184, 600 184, 551	29	183, 700 183, 651	47	182, 800 182, 751	65
185, 450 185, 401	12	184, 550 184, 501	30	183, 650 183, 601	48	182, 750 182, 701	66
185, 400 185, 351	13	184, 500 184, 451	31	183, 600 183, 551	49	182, 700 182, 651	67
185, 350 185, 301	14	184, 450 184, 401	32	183, 550 183, 501	50	182, 650 182, 601	68
185, 300 185, 251	15	184, 400 184, 351	33	183, 500 183, 451	51	182, 600 182, 551	69
185, 250 185, 201	16	184, 350 184, 301	34	183,450 183,401	52	182, 550 182, 501	70
185, 200 185, 151	17	184, 300 184, 251	35	183, 400 183, 351	53	182, 500 182, 451	71
185,150 185,101	18	184, 250 184, 201	36	183, 350 183, 301	54	182, 450 182, 401	72

CF8-6814-01-A

BM5 72 21 00 8 LHMO - 21 - 16
DM5

Moment Weight Classification Table
Figure 803

MOMENT WEIGHT IN GRAM-INCHES	CLASS NO.	MOMENT WEIGHT IN GRAM-INCHES	CLASS NO.	MOMENT WEIGHT IN GRAM-INCHES	CLASS NO.	MOMENT WEIGHT IN GRAM-INCHES	CLASS NO.
182, 400 182, 351	73	181, 500 181, 451	91	180, 600 180, 551	109	179, 700 179, 651	127
182, 350 182, 301	74	181, 450 181, 401	92	180, 550 180, 501	110	179, 650 179, 601	128
182, 300 182, 251	75	181, 400 181, 351	93	180, 500 180, 451	111	179, 600 179, 551	129
182, 250 182, 201	76	181, 350 181, 301	94	180, 450 180, 401	112	179, 550 179, 501	130
182, 200 182, 151	77	181, 300 181, 251	95	180, 400 180, 351	113	179, 500 179, 451	131
182, 150 182, 101	78	181, 250 181, 201	96	180, 350 180, 301	114	179, 450 179, 401	132
182, 100 182, 051	79	181, 200 181, 151	97	180, 300 180, 251	115	179, 400 179, 351	133
182, 050 182, 001	80	181, 150 181, 101	98	180, 250 180, 201	116	179, 350 179, 301	134
182, 000 181, 951	81	181, 100 181, 051	99	180, 200 180, 151	117	179, 300 179, 251	135
181, 950 181, 901	82	181, 050 181, 001	100	180, 150 180, 101	118	179, 250 179, 201	136
181, 900 181, 851	83	181, 000 180, 951	101	180, 100 180, 051	119	179, 200 179, 151	137
181, 850 181, 801	84	180, 950 180, 901	102	180, 050 180, 001	120	179, 150 179, 101	138
181, 800 181, 751	85	180, 900 180, 851	103	180, 000 179, 951	121	179, 100 179, 051	139
181, 750 181, 701	86	180, 850 180, 801	104	179, 950 179, 901	122	179, 050 179, 001	140
181, 700 181, 651	87	180, 800 180, 751	105	179, 900 179, 851	123	179, 000 178, 951	141
181, 650 181, 601	88	180, 750 180, 701	106	179, 850 179, 801	124	178, 950 178, 901	142
181, 600 181, 551	89	180, 700 180, 651	107	179, 800 179, 751	125	178, 900 178, 851	143
181, 550 181, 501	90	180, 650 180, 601	108	179, 750 179, 701	126	178, 850 178, 801	144

CF8-6815-01-A

BM5 72 21 00 8 LJM0 01

Moment Weight Classification Table
Figure 804

MOMENT WEIGHT IN GRAM-INCHES	CLASS NO.	MOMENT WEIGHT IN GRAM-INCHES	CLASS NO.	MOMENT WEIGHT IN GRAM-INCHES	CLASS NO.	MOMENT WEIGHT IN GRAM-INCHES	CLASS NO.
178, 800 178, 751	145	177, 900 177, 851	163	177, 000 176, 951	181	176, 100 176, 051	199
178, 750 178, 701	146	177, 850 177, 801	164	176, 950 176, 901	182	176, 050 176, 001	200
178, 700 178, 651	147	177, 800 177, 751	165	176, 900 176, 851	183	176, 000 175, 951	201
178, 650 178, 601	148	177, 750 177, 701	166	176, 850 176, 801	184	175, 950 175, 901	202
178, 600 178, 551	149	177, 700 177, 651	167	176, 800 176, 751	185	175, 900 175, 851	203
178, 550 178, 501	150	177, 650 177, 601	168	176, 750 176, 701	186	175, 850 175, 801	204
178, 500 178, 451	151	177, 600 177, 551	169	176, 700 176, 651	187	175, 800 175, 751	205
178, 450 178, 401	152	177, 550 177, 501	170	176, 650 176, 601	188	175, 750 175, 701	206
178, 400 178, 351	153	177, 500 177, 451	171	176, 600 176, 551	189	175, 700 175, 651	207
178, 350 178, 301	154	177, 450 177, 401	172	176, 550 176, 501	190	175, 650 175, 601	208
178, 300 178, 251	155	177, 400 177, 351	173	176, 500 176, 451	191	175, 600 175, 551	209
178, 250 178, 201	156	177, 350 177, 301	174	176, 450 176, 401	192	175, 550 175, 501	210
178, 200 178, 151	157	177, 300 177, 251	175	176, 400 176, 351	193	175, 500 175, 451	211
178, 150 178, 101	158	177, 250 177, 201	176	176, 350 176, 301	194	175, 450 175, 401	212
178, 100 178, 051	159	177, 200 177, 151	177	176, 300 176, 251	195	175, 400 175, 351	213
178, 050 178, 001	160	177, 150 177, 101	178	176, 250 176, 201	196	175, 350 175, 301	214
178, 000 177, 951	161	177, 100 177, 051	179	176, 200 176, 151	197	175, 300 175, 251	215
177, 950 177, 901	162	177, 050 177, 001	180	176, 150 176, 101	198		

1025129-02-A

BMS 72 21 00 8 LKMA - 00

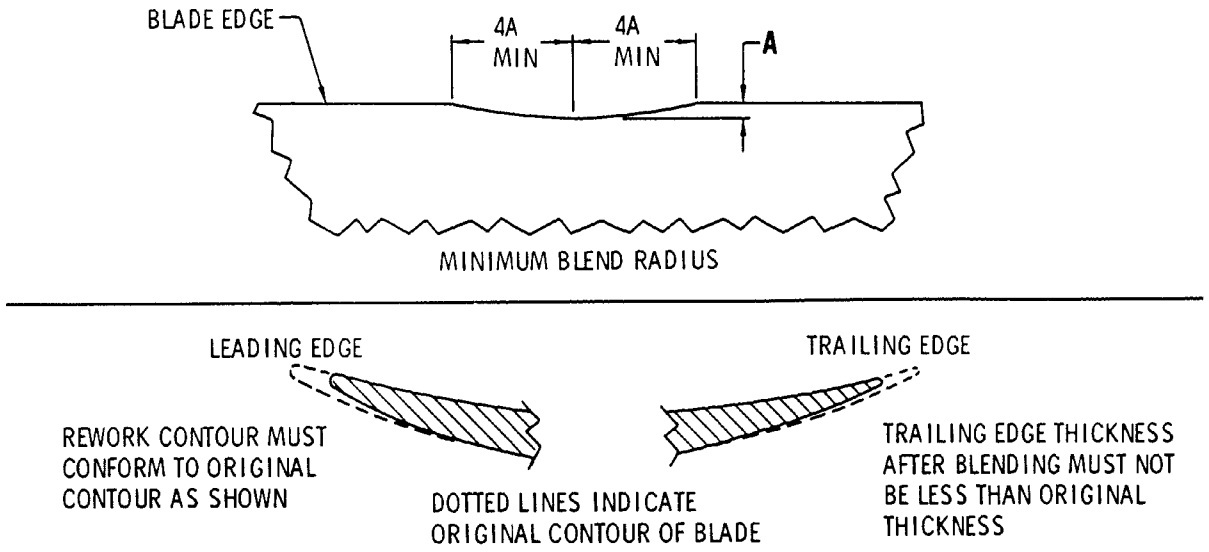
Moment Weight Classification Table (Sheet 1/2)
Figure 805

MOMENT WEIGHT IN GRAM-INCHES	CLASS NO.	MOMENT WEIGHT IN GRAM-INCHES	CLASS NO.	MOMENT WEIGHT IN GRAM-INCHES	CLASS NO.	MOMENT WEIGHT IN GRAM-INCHES	CLASS NO.
175, 250 175, 201	216	174, 350 174, 301	234	173, 450 173, 401	252		
175, 200 175, 151	217	174, 300 174, 251	235	173, 400 173, 351	253		
175, 150 175, 101	218	174, 250 174, 201	236	173, 350 173, 301	254		
175, 100 175, 051	219	174, 200 174, 151	237	173, 300 173, 251	255		
175, 050 175, 001	220	174, 150 174, 101	238	173, 250 173, 201	256		
175, 000 174, 951	221	174, 100 174, 051	239	173, 200 173, 151	257		
174, 950 174, 901	222	174, 050 174, 001	240	173, 150 173, 101	258		
174, 900 174, 851	223	174, 000 173, 951	241	173, 100 173, 051	259		
174, 850 174, 801	224	173, 950 173, 901	242	173, 050 173, 001	260		
174, 800 174, 751	225	173, 900 173, 851	243	172, 000 172, 951	261		
174, 750 174, 701	226	173, 850 173, 801	244	172, 950 172, 901	262		
174, 700 174, 651	227	173, 800 173, 751	245	172, 900 172, 851	263		
174, 650 174, 601	228	173, 750 173, 701	246	172, 850 172, 801	264		
174, 600 174, 551	229	173, 700 173, 651	247				
174, 550 174, 501	230	173, 650 173, 601	248				
174, 500 174, 451	231	173, 600 173, 551	249				
174, 450 174, 401	232	173, 550 173, 501	250				
174, 400 174, 351	233	173, 500 173, 451	251				

1095977-01-A

BM5 72 21 00 8 LKMB - 01

Moment Weight Classification Table (Sheet 2/2)
Figure 805



BM5 72 21 00 8 LLMO - 13 - 08
DM5

Leading and Trailing Edge Blending
Figure 806

(6)Install 3 guide pins, 2C6920P01, into stage 1 rotor disk forward flange.
(7)Lubricate the seal ring with Material No.C02-008 or Material No.C02-033.
(8)Align and install the seal ring around the stage 1 rotor disk. Make sure the rounded edge of the seal is forward and the tapered end is aft towards the fan disk.
(a)Make sure that the three painted dots on the seal face are outward. If the dots are worn away, install the seal with the short taper outboard and the long taper inboard.
(9)Position spinner to disk aligning the offset hole (the offset hole in spinner is identified with the letter "O" and the bolt hole counterbore is painted white) of spinner to that of disk (the offset bolt hole in the disk is identified with the letters "OS").
(10)Coat the bolt head washer faces and threads with lubricant (C02-019) and install bolts.

R NOTE : Two types of bolts (hollow head and solid head) are available to
R keep the spinner in position. Use only one type of bolt so that
R possible rotor imbalance does not occur. If you must use both
R types of bolts, install equivalent bolts 180 degrees apart to
R keep rotor imbalance to a minimum.

(a)TORQUE bolts to between 300 and 320 lbf.in. (3.39 and 3.62 m.daN).
(b)Loosen bolts 1/2 turn and RETORQUE to between 300 and 320 lbf.in. (3.39 and 3.62 m.daN).
(c)Remove guide pins and install remaining bolts. Tighten and use same procedure as previous bolts.
(11)If you think the fan is not balanced because of maintenance actions, you can do the vibration survey.
(a)Do the vibration survey (Ref. 72-00-00, P. Block 501).

4. Stage 1 Fan Blade/Fan Case Shroud Seizure Repair

A. Equipment and Materials

ITEM	DESIGNATION
Referenced Procedures	
- 72-21-00, P. Block 601	Fan Rotor Assembly
- 72-22-00, P. Block 601	Forward Fan Case Assembly
- 72-22-00, P. Block 801	Forward Fan Case Assembly

B. Procedure

(1)Remove the fan spinner per paragraph 3.
(2)Inspect blade(s) (Ref. 72-21-00, P. Block 601).
(3)Blend blade(s) per paragraph 2.
(4)Spot fluorescent-penetrant-inspect blade(s).
(5)Inspect/repair fan forward case abradable shroud material (Ref. 72-22-00, P. Block 601 and 72-22-00, P. Block 801).
(a)In the lower half of fan case, between the 3 and 9 o'clock positions, blend away any evidence of steps in the area of the blade trailing edge.
NOTE : Blend step in the fore to aft direction in a tapered/linear

manner a minimum of 0.6 in. (15 mm) and not to exceed 0.75 in. (19.1 mm) from edge of step.

(6)Install spinner per paragraph 3.

5. Stage 1 Fan Rotor Blade Retainer Repair

A. Equipment and Materials

ITEM	DESIGNATION
(1)Material No.C01-006	Adhesives, Plastics, Sealants (Ref. 70-00-00)
(2)Material No.C01-014	Adhesives, Plastics, Sealants (Ref. 70-00-00)
(3)Material No.C04-001	Cleaning Compounds and Solvents (Ref. 70-00-00)

B. Repair

(1)Lightly blend the damaged area with an abrasive wheel. Do not remove parent material.

WARNING : DO NOT USE METHYL ETHYL KETONE, TT-M-261, NEAR FLAMES OR HEAT OR LET IT STAY ON YOUR SKIN. ALSO, MAKE SURE YOU HAVE A GOOD FLOW OF CLEAN AIR. THIS MATERIAL IS FLAMMABLE AND DANGEROUS TO YOUR SKIN, EYES, AND LUNGS.

(2)Clean the retainer seal surface with Material No.C04-001. Let the area dry for approximately 30 minutes.

(3)Buildup the damaged area with Material No.C01-006.

(4)Let the sealant cure at room temperature, approximately 75°F (24°C), for six hours.

(5)Measure the sealant bead height. The sealant must not extend 0.040 in. (1.02 mm) above the adjacent retainer surfaces.

(6)Measure the height of the bead.

(7)If the bead is too high, cut the bead with a razor blade until you get the necessary height.

C. Replacement

(1)Use a razor blade to remove as much of the seal that is possible.

(2)Use a wire brush to remove the remaining seal pieces.

WARNING : DO NOT USE METHYL ETHYL KETONE, TT-M-261, NEAR FLAMES OR HEAT OR LET IT STAY ON YOUR SKIN. ALSO, MAKE SURE YOU HAVE A GOOD FLOW OF CLEAN AIR. THIS MATERIAL IS FLAMMABLE AND DANGEROUS TO YOUR SKIN, EYES, AND LUNGS.

(3)Clean the retainer seal surface with Material No.C04-001. Let the area dry for approximately 15 minutes.

(4)Apply a thin layer of Material No.C01-014, approximately 0.003 in. (0.08 mm), with a stiff, nylon-bristled brush. Let the primer dry for one hour at room temperature.

(5)Apply a smooth bead of Material No.C01-006 on the seal surface of the retainer. The adhesive sealant must not extend 0.040 in. (1.02 mm) above or 0.020 in. (0.51 mm) below the adjacent retainer surface.

NOTE : Make certain that the time between the application of the primer

and the application of the adhesive sealant is less than six hours. If the time (between the application of the primer and the application of the adhesive sealant) is longer than six hours, remove the primer by sanding with 200 grit abrasive sandpaper or emery cloth. Do steps 6.C.(3) through 6.C.(5) again.

(6) Measure the sealant bead height. The sealant must not extend 0.040 in. (1.02 mm) above or 0.020 in. (0.51 mm) below the adjacent retainer surfaces.

(7) Let the sealant cure at room temperature, approximately 75°F (24°C), for six hours.

(8) Measure the height of the bead.

(9) If the bead is too high, cut the bead with a razor blade until you get the necessary height.

(10) If the bead height is too low, replace the adhesive sealant (refer 6.C.).

6. Optional Procedure - RTV Sealant Repair on Dovetail Slots

A. Equipment and Materials

ITEM	DESIGNATION
(1) Material No.C01-006	Adhesives, Plastics, Sealants (Ref. 70-00-00)
(2) Material No.C01-056	Adhesives, Plastics, Sealants (Ref. 70-00-00)
(3) Material No.C04-035	Cleaning Compounds and Solvents (Ref. 70-00-00)
(4) Material No.C04-102	Cleaning Compounds and Solvents (Ref. 70-00-00)
(5)	Caulking gun-commercially available (optional)

B. Procedure

(1) Seal the gap between the blade dovetail slots as follows :

WARNING : CLEANING SOLVENTS ARE HIGHLY FLAMMABLE. USE ONLY IN AREAS THAT HAVE A GOOD FLOW OF AIR. DO NOT LET CLEANING SOLVENTS TOUCH YOUR EYES OR STAY ON YOUR SKIN REGULARLY AND/OR CONTINUOUSLY.

(a) Make sure to clean all oil and dirt from all surfaces to be sealed. Use a mixture of 50 percent (by volume) Material No. 004-102 and 50 percent Material No.C04-035. Dry all surfaces with clean shop air.

(b) Apply a layer of Material No.C01-006 or Material No.C01-056 to the internal surfaces of the opening in the blade retainer. Also put a layer on the top surfaces of the retainer-key. The layer of RTV adhesive must have a thickness between 0.005-0.050 in. (0.13-1.27 mm). (Ref. Fig. 807).

NOTE : A caulking gun can be used to make the RTV adhesive easier to apply.

(c) Immediately remove all unwanted RTV adhesive from the dovetail slots and disk.

(d)Cure the RTV adhesive for a minimum of 4 hours at room temperature 70°F to 90°F (21°C to 32°C).

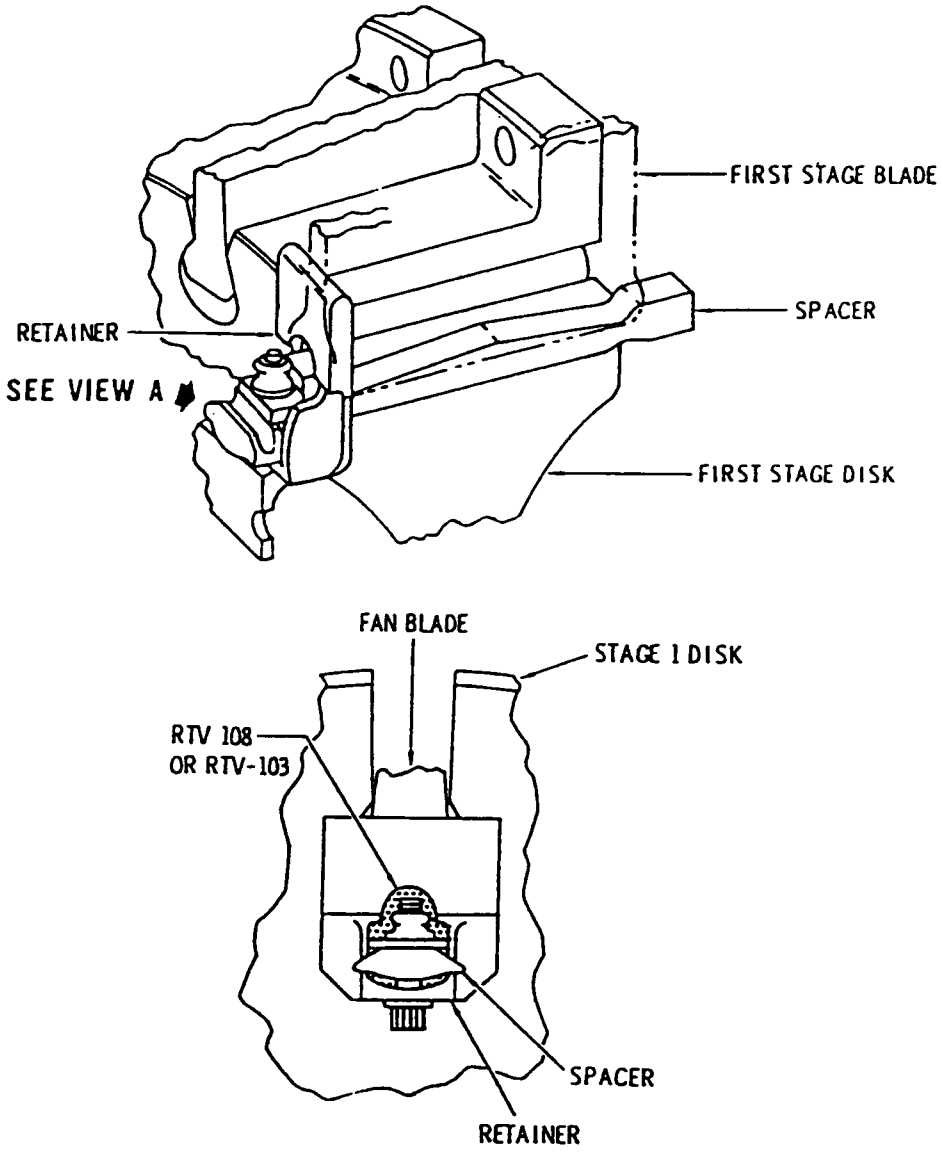
7. Not Applicable

8. Replacement of the Stage 1 Fan Rotor Disk

A. Equipment and Materials

ITEM	DESIGNATION
(1)2C8008	Fixture, Remove - Fan Stator Fairing
(2)2C14685	Adapter, Fan Stator to Fan Disk
R (3)2C6075	Protector, Stage 1 Fan Disk Bore (Recommended)
R or	
R 2C14890	Protector, Stage 1 Fan Disk Bore (Alternative)
(4)2C6856	Fixture, Lift - Fan Rotor Subassembly
(5)2C14686	Adapter, Lift - LP Compressor
(6)2C14227	Dolly Subassemblies - Frames
(7)2C6122	Fixture, Instl/Rmv Bolts - Fwd Fan Shaft
(8)2C6348	Pins, Guide - Fan Rotor Installation
(9)2C14738	Adapter, Rmv/Instl - Stage 1 Fan Disk Nuts
10)2C14769	Tool Rmv/Instl - Stage 1 Fan Disk Nuts
11)Material No.C01-057	Adhesives, Plastics, Sealants (Ref. 70-00-00)
12)Material No.C02-004	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
13)Material No.C02-006	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
14)Material No.C02-019	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
15)Material No.C02-058	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
16)Material No.C04-001	Cleaning Compounds and Solvents (Ref. 70-00-00)
Referenced Procedures	
- 71-00-00, P. Block 501	Power Plant - General
- 71-11-00, P. Block 401	Nose Cowl
- 72-21-00, P. Block 401	Fan Rotor Assembly
- 72-21-00, P. Block 801	Fan Rotor Assembly
- 72-21-01, P. Block 401	No. 1 Bearing Manifold

B. Removal (Ref. Fig. 808, 809)
(1)Remove the nose cowl (Ref. 71-11-00, P. Block 401).
(2)Remove the fan spinner (Ref. 72-21-00, P. Block 801).
(3)Turn the disk until the offset hole in the spinner bolt circle on the disk is at the 12 o'clock position.
(4)Remove the stage 1 fan blades (Ref. 72-21-00, P. Block 401).
(5)Remove the No. 1 bearing manifold (Ref. 72-21-01, P. Block 401).



BM5 72 21 00 8 LPM0 00

RTV Application on Dovetail Slots
Figure 807

(6)Remove the stage 1 fan booster stator fairing (the stage 1 fairing).
(a)Remove the 32 screws that attach the stage 1 fairing to the stage 2-4 fan booster stator case (the stage 2-4 case). These screws attach the forward end of the outlet vane fairings and go into threaded bosses in the stage 2-4 case.
(b)Put the fixture 2C8008 onto the aft end of the stage 1 fairing.
(c)Remove the stage 1 fairing from the stage 2-4 case.
(7)Remove the stage 1 fan booster stator vane sub-assembly.
(a)Remove the 96 nuts, washers, and bolts that attach the vane sub-assembly to the forward flange of the stage 2-4 case.
(b)Remove the stage 1 booster stator vane sub-assembly and put on a clean skid.
(8)Install anti-torque adapter 2C14685 to the stage 1 fan rotor disk.
(a)Use bolts to attach the bracket to the first two holes below the horizontal centerline of the forward fan case (4 o'clock side forward looking aft, for torquing bolts ; the 8 o'clock side for loosening the bolts).
(b)Attach the clevis end of the torque arm to the bracket with a quick release pin.
(c)Use bolts to attach the angle end of the torque arm to the stage 1 fan rotor disk. Attach the bolts on the fan spinner bolt circle at the 6 o'clock position.
R (9)Install the stage 1 fan disk bore protector 2C6075 (Recommended) or
R 2C14890 (Alternative).
(10)Loosen the nuts that attach the stage 1 fan rotor disk to the forward fan shaft, but do not remove the nuts at this time.
(11)Matchmark the stage 1 fan rotor disk to the booster spool and the forward fan shaft.
(12)Make an identification diagram of the parts and matchmarks. Include areas that you can use for identification (such as the offset holes, the part number, the serial number). Use this diagram to align the parts if the matchmarks are removed.
CAUTION : MAKE SURE THAT YOU PREVENT DAMAGE TO THE DOVETAIL SLOTS WHILE USING THE LOCALLY MANUFACTURED TOOL.
(13)Remove the nuts that attach the stage 1 fan rotor disk to the stage 2-5 spool.
(a)Use locally manufactured tool to get access to the bolt heads through the disk dovetail slots (Ref. Fig. 810).
(b)Remove the nuts, but leave the bolts installed.
(14)Remove the anti-torque adapter 2C14685.
(15)Use plastic or phenolic material to make shims and install under stage 2 rotor blades from 4 o'clock to 8 o'clock. This will prevent any movement of the low pressure compressor when the stage 1 disk is removed.
(16)Attach lift fixture 2C6856 to the lift adapter 2C14686 which you can find in stand 2C14227.
(17)Install lift adapter 2C14686 on the stage 1 fan rotor disk as follows :
NOTE : The bolt circle on the spinner has one offset hole. This hole must be positioned at 12 o'clock before you install the lift adapter 2C14686.
(a)Use nine 3/8 in. hex head bolts to attach the stage 1 fan rotor disk to the lift adapter 2C14686. These bolts attach to the stage 1 fan

rotor disk at the fan spinner bolt circle.
(18)Remove all but four of the nuts on the bolts that attach the stage 1 fan rotor disk to the forward fan shaft.
(19)Apply tension to the lift fixture 2C6856 and set for the correct center of gravity for the stage 1 fan rotor disk only.
(a)Remove the remaining four nuts on the forward fan shaft bolts.
(20)Carefully remove the stage 1 fan rotor disk and the lift adapter 2C14686.
(21)Put the disk and the lift adapter 2C14686 into the stand 2C14227.
(22)Remove the stage 1 fan rotor disk from the lift adapter.
(23)To remove the bolts from the forward fan shaft, tap with a plastic or rubber mallet or use fixture 2C6122.

C. Installation (Ref. Fig. 808, 809)
(1)Install the stage 1 fan rotor disk lift adapter 2C14686 to the stage 1 fan rotor disk with attachment bolts.
(a)Attach at the fan rotor spinner bolt circle with nine 3/8 in. hex head bolts.
(2)Install lift fixture 2C6856 to lift adapter and place the stage 1 fan rotor disk with lift adapter into assembly stand 2C14227.
(a)Safety with two ball-lock pins.
(b)Remove lift fixture 2C6856.
(3)Install preformed packing lubricated with Material No.C02-019 in ring groove of stage 1 fan rotor disk, forwad of aft inner mounting flange.

SB 72-1139

NOTE : If the stage 1 fan rotor disk has been modified to receive fan blade dovetail sacrificial shims, do not install the dovetail seals because they will hit the shims that you will install with the blades.

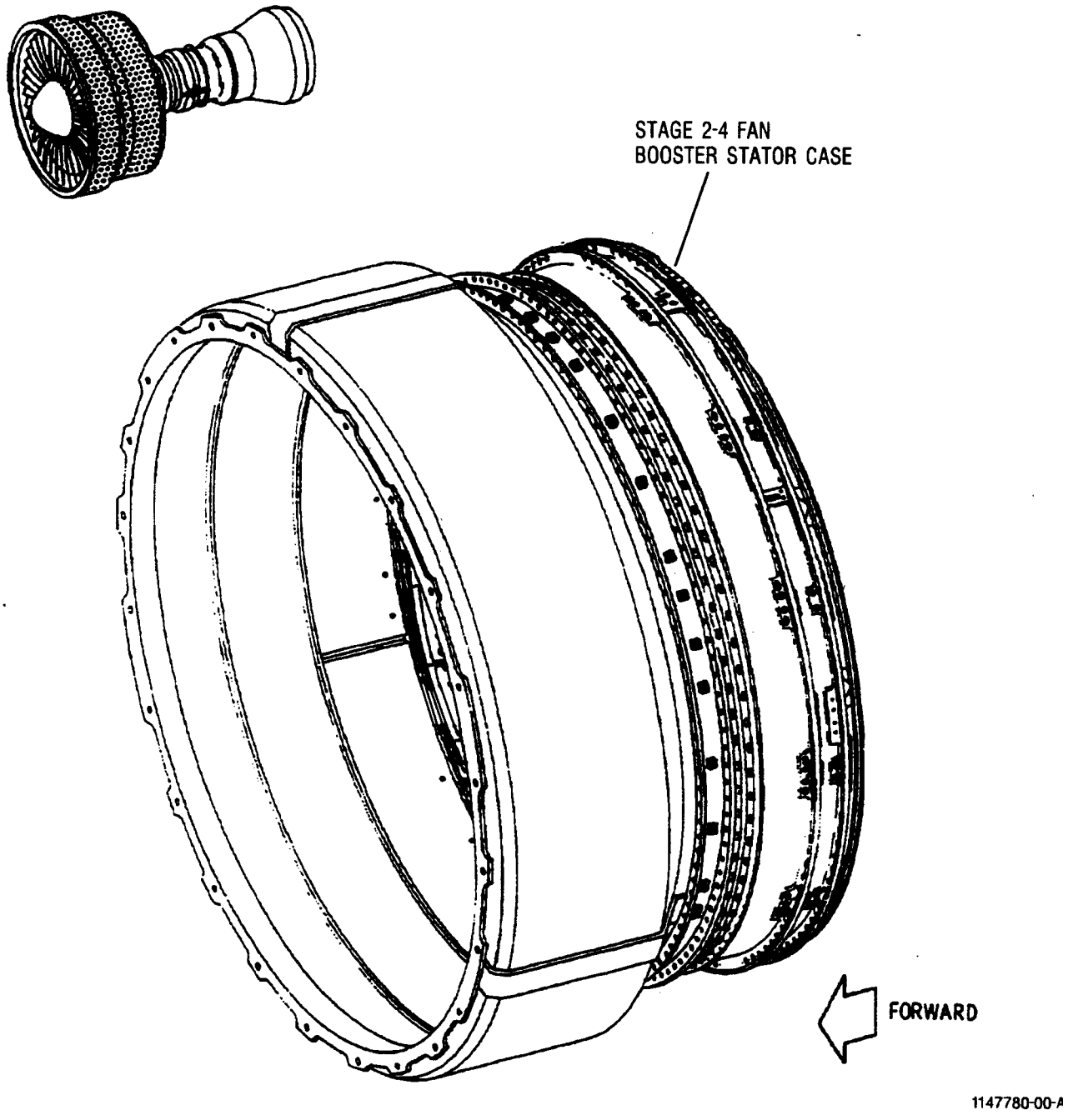
END SB 72-1139

(4)Install aft dovetail seals to the stage 1 fan rotor disk as follows :

WARNING : SOLVENTS ARE TOXIC. AVOID INHALATION OF VAPORS AND PROLONGED CONTACT WITH EYES, SKIN, OR CLOTHING. OPERATOR SHOULD USE ONLY IN WELL VENTILATED AREA.

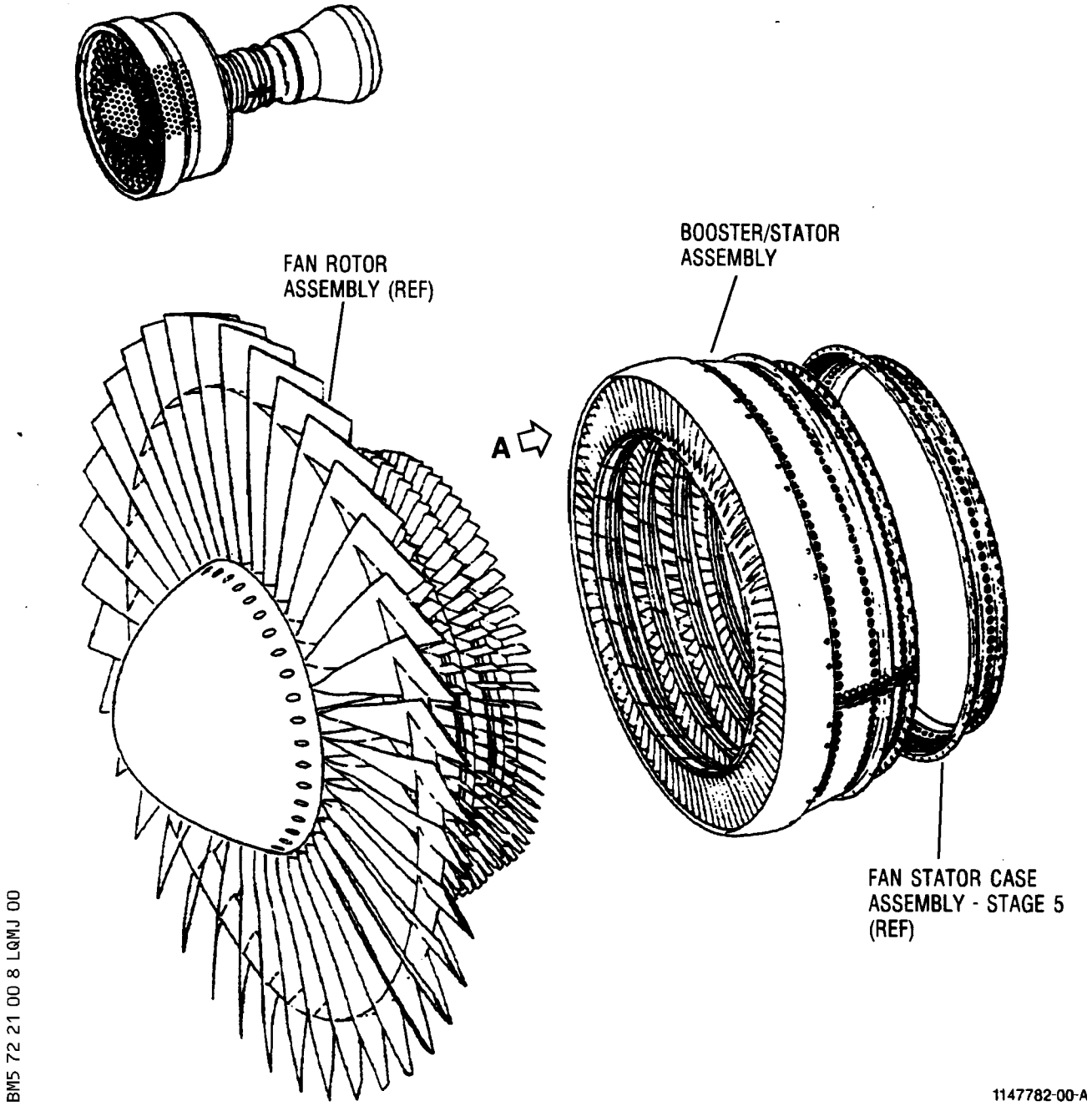
(a)Clean surface with Material No.C04-001.
(b)Apply two thin coats of Material No.C01-057.
(c)Install aft dovetail seals across the disk post. Install the side tabs into the blade slots to get a good fit.
(d)Wipe off any excessive Material No.C01-057 especially from stage 1 dovetail pressure faces. Remove any adhesive that squeezes out of the joint.
(e)Cure at room temperature for 24 hours or 90 minutes at 200 deg.F (93.3 deg.C).
(5)Install bolts into the stage 2-5 spool with bolt heads aft. Coat threads of bolts with Material No.C02-058.
(6)Install the stage 1 fan rotor disk on the stage 2-5 spool while you align matchmark locations.

NOTE : You must align the disk to spool matchmark as well as the disk to forward fan shaft matchmarks. Make sure that matchmarked components are correctly aligned to avoid an unbalanced condition. Align matchmark on spool with the serial number

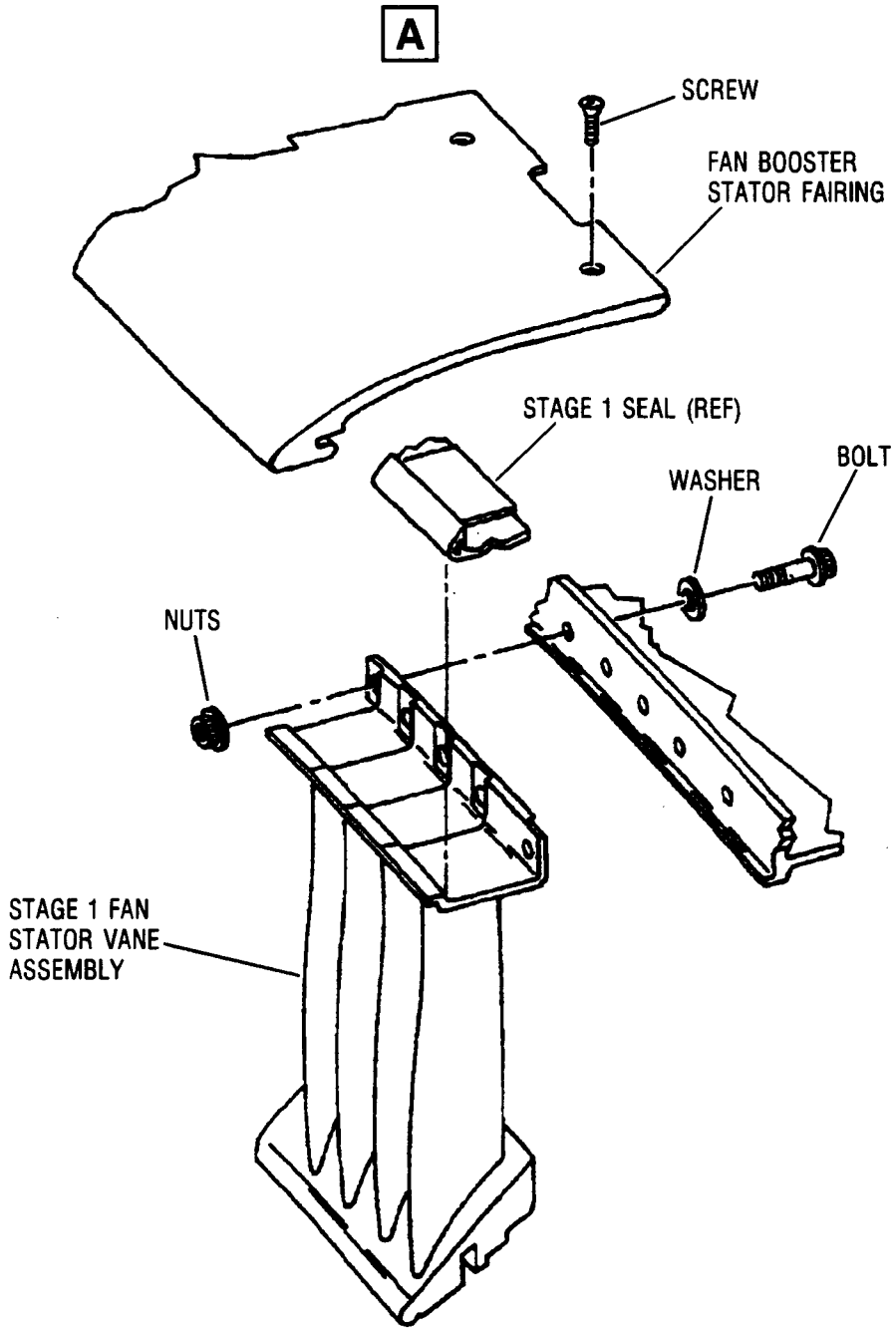


BM5 72 21 00 8 LQMA 00

Fan Module - Major Assemblies (Sheet 1/3)
Figure 808

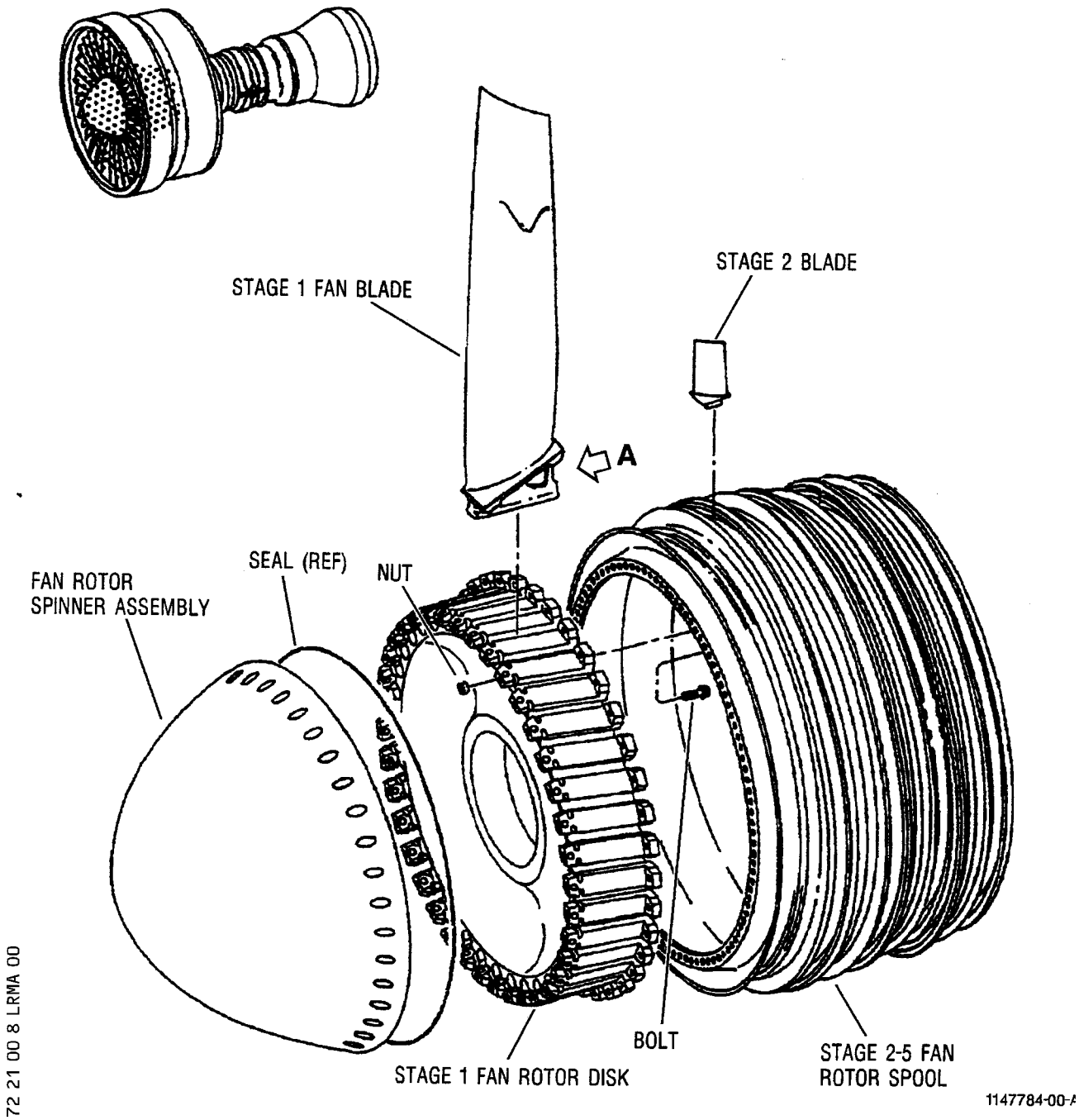


Fan Module - Major Assemblies (Sheet 2/3)
Figure 808

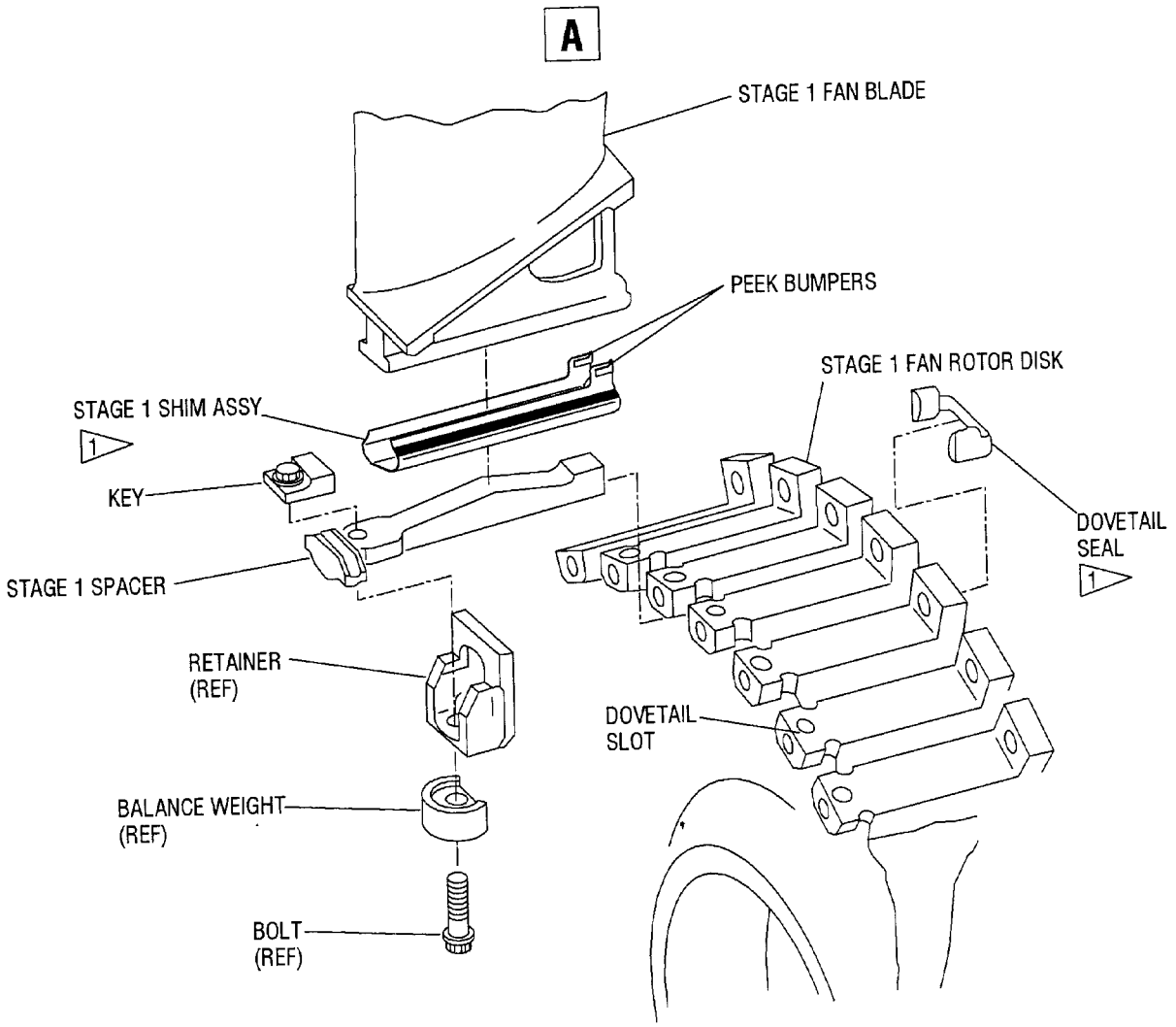


BM5 72 21 00 8 LQMS 00

Fan Module - Major Assemblies (Sheet 3/3)
Figure 808



Rotor - Fan Assembly (Sheet 1/3)
Figure 809

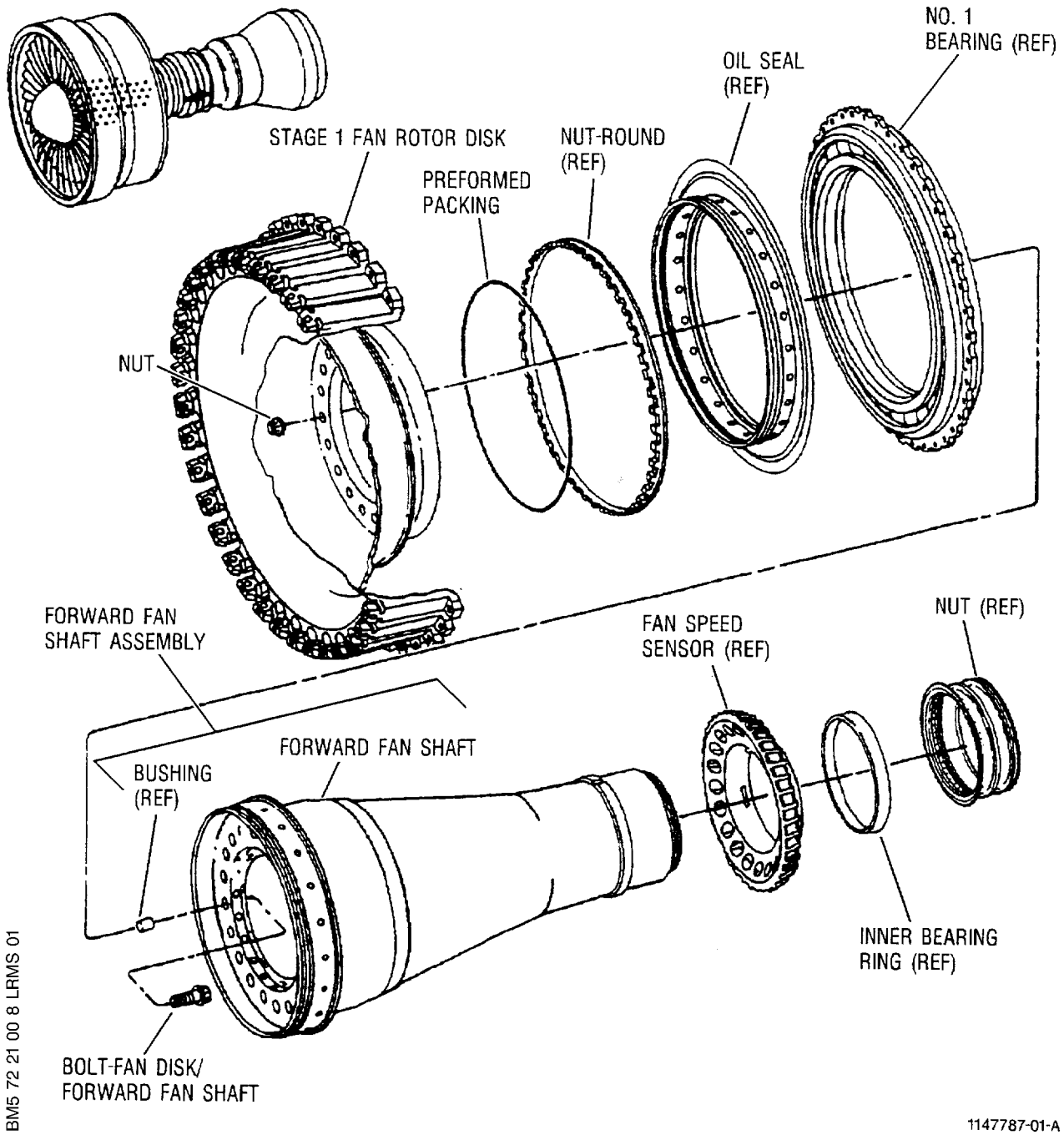


1 NOTE: ON ENGINES WITH MODIFIED STAGE 1 FAN ROTOR DISK PER GE SB 72-1139 OR SIMILAR (TO USE SACRIFICIAL DOVETAIL SHIM ASSEMBLIES)THE STAGE 1 SPACER IS ALSO MODIFIED. THE DOVETAIL SEALS ARE NOT USED DUE TO INTERFERENCE WITH THE SHIMS.

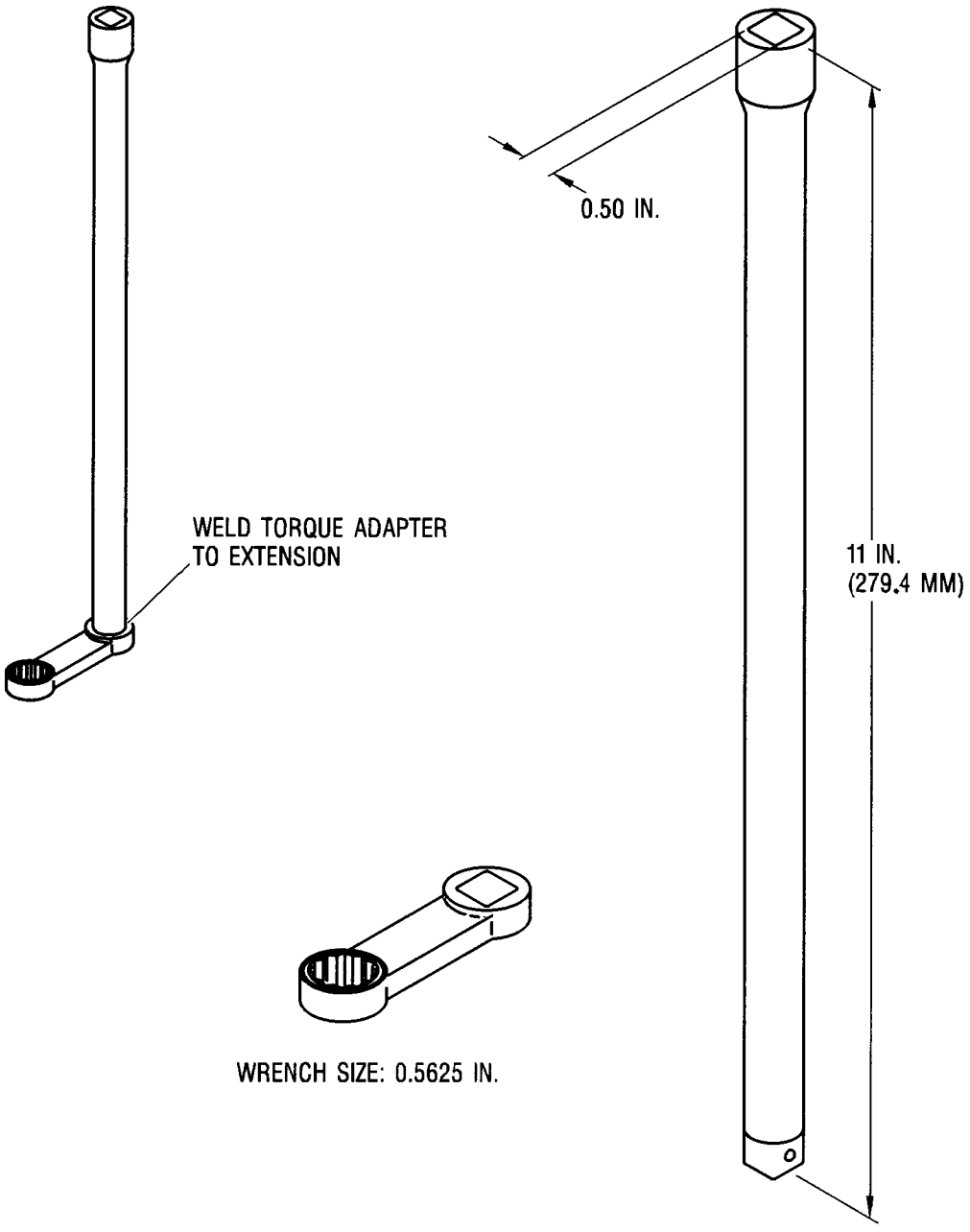
1240508-00

BM5 72 21 00 8 LRMJ 01

R Rotor - Fan Assembly (Sheet 2/3)
Figure 809



Rotor - Fan Assembly (Sheet 3/3)
Figure 809



BM5 72 21 00 8 LSM0 00

Locally Manufactured Tool
Figure 810

location on the fan rotor disk.
(a)Use three guide pins 2C6348 to help align the fan rotor disk with the forward fan shaft.
(b)Make sure that the aft face of the disk does not push the spool bolts aft. All spool bolts must engage into the holes in the disk.

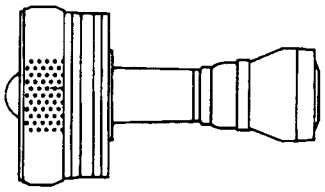
CAUTION : WEAR THERMAL GLOVES AT ALL TIMES WHEN HANDLING HEATED OR CHILLED PARTS TO AVOID HAND INJURIES.

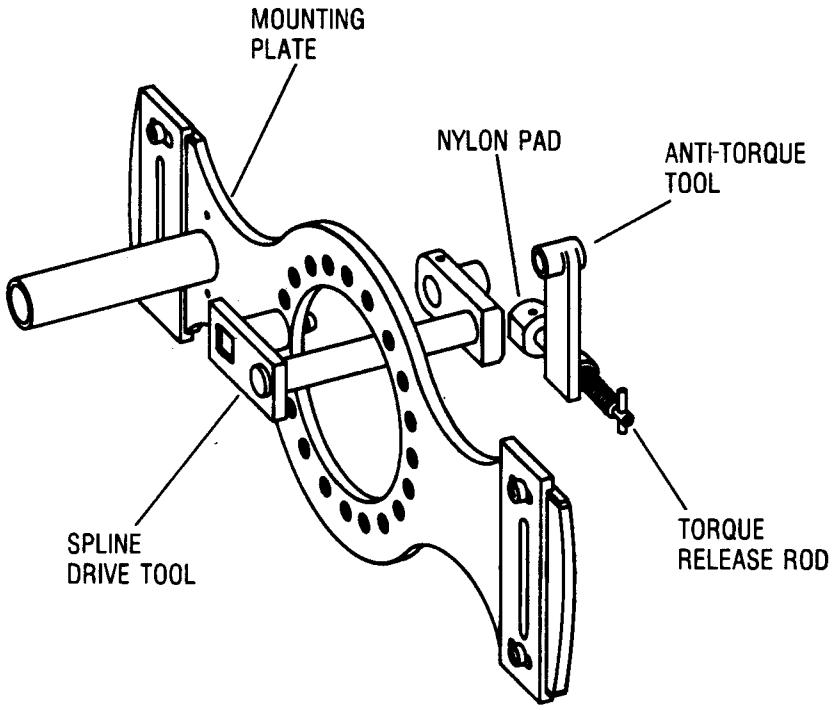
(7)Chill fan rotor disk/forward fan shaft bolts for a minimum of 20 minutes before they are installed.
(8)Apply Material No.C02-058 to the threads of the bolts and to the threads and washer faces of the nuts.
(9)Apply Material No.C02-058 to the stage 1 fan rotor disk inner mounting flange bolt hole spot faces.
(10)Use fixture 2C6122 to install four bolts spaced equally around the forward fan shaft and stage 1 fan rotor disk mating flanges.
(11)Install the four nuts and use socket 2C14738 to tighten, but do not torque at this stage.
(12)Remove the three guide pins 2C6348.
(13)Use fixture 2C6122 to install the remaining fan rotor disk/forward fan shaft bolts.
(14)Install nuts and tighten, but do not torque at this stage.
(15)Remove lift adapter 2C14686.
(16)Install anti-torque adapter 2C14685.
(17)Use locally manufactured tool to get access to the bolt heads to tighten bolts and nuts that attach the fan rotor disk to the stage 2-5 spool (Ref. Fig. 810).
(a)TORQUE the nuts to between 620 and 640 lbf.in. (7.00 and 7.23 m.daN).
(b)Loosen the nuts one-half turn and TORQUE the nuts again to between 620 and 640 lbf.in. (7.00 and 7.23 m.daN).
(18)After the fan rotor disk/forward fan shaft bolts get to room temperature, TORQUE nuts to between 275 and 285 lbf.ft. (37.28 and 38.64 m.daN) with tool set 2C14769. Install tool set 2C14769 as follows : (Ref. Fig. 811)
(a)Attach mounting plate to stage 1 fan rotor disk with two screws and two washers.

NOTE : Do not tighten the screws until the twenty equally spaced holes are aligned with the nuts on the disk.

(b)Put the anti-torque tool on a bolt with the nylon pad on the inside diameter of the forward fan shaft.
(c)Adjust the torque release rod to move the nylon pad against the inside bore of the fan shaft.
(d)Put the spline drive tool on the nut.
(e)Use a torque multiplier to torque the nuts.
(19)Torque all nuts in a criss-cross pattern.
(20)Loosen 1/2 turn and TORQUE the nuts again to between 275 and 285 lbf.ft. (37.28 and 38.64 m.daN) with tool set, 2C14769.
(21)Remove shim material from the stage 2 booster blades.
(22)Remove the anti-torque adapter 2C14685.
(23)Install the stage 1 fan booster stator vane sub-assembly.
(a)Apply Material No.C02-004, or C02-006 to the threads and washer face of 96 nuts.

(b)Install the stage 1 stator vane sub-assembly to the forward flange of the stages 2-4 stator case.
1 Attach the stage 1 stator vane sub-assembly to the stages 2-4 stator case with 96 bolts, washers, and nuts.
NOTE : Install the stage 1 stator vane bolts with the bolt heads aft and with washers under the heads.
2 TORQUE the 96 nuts to between 100 and 120 lbf.in. (1.13 and 1.36 m.daN).
(24)Install the stage 1 fan booster stator fairing.
(a)Apply Material No.C02-004 to the forward outboard side of the stage 1 vane forward rail.
(b)Apply Material No.C02-004, or C02-006 to the threads of 32 fairing/outlet guide vane attachment screws.
(c)Install the stage 1 fairing over the stage 1 vanes. Make sure that the groove in the stage 1 fairing engages the forward rail of the stage 1 stator vanes.
(d)Attach stage 1 fairing to stage 2-4 booster stator case with 32 screws.
(e)TORQUE 32 screws to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN).
(25)Install the stage 1 fan rotor blades (Ref. 72-21-00, P. Block 401).
(26)Install the No. 1 bearing manifold (Ref. 72-21-01, P. Block 401).
(27)Install the fan rotor spinner (Ref. 72-21-00, P. Block 801).
(28)Install the nose cowl (Ref. 71-11-00, P. Block 401).
(29)Do the test as shown in "Type of Testing After Engine or Component Replacement" (Ref. 71-00-00, P. Block 501).





BM5 72 21 00 8 LTMO 00

1147788-00-A

Tool Set, Installation or Removal,
Stage 1 Fan Disk Nuts
Figure 811

NO. 1 BEARING MANIFOLD - REMOVAL/INSTALLATION

1. General

A. This procedure describes the removal/installation of the No. 1 bearing manifold.

2. Equipment and Materials

ITEM	DESIGNATION
A. 2C14871	Puller, Manifold - No. 1 Bearing Remove/Install
B. 2C6823	Puller, Manifold - No. 1 Bearing Remove/Install
C. Material No.C02-019	Oil, Engine Lubricating (Ref. 70-00-00)
Referenced Procedure - 72-21-00, P. Block 801	Fan Rotor Spinner

3. Remove No. 1 Bearing Manifold (Ref. Fig. 401)

A. Remove fan rotor spinner (Ref. 72-21-00, P. Block 801)
NOTE : Do not loosen balance weight screws in the spinner cone.

Pre SB GE 72-067 *** (No. 1 Bearing Manifold Assembly secured to forward fan shaft with bolts only).

B. Remove the bolts which secure the No. 1 bearing manifold to the inner diameter of the fan forward shaft.

C. Remove manifold using puller 2C6823 or 2C14871. Discard the preformed packings.

End Pre SB GE 72-067.

SB GE 72-067 *** (No. 1 Bearing Manifold Assembly secured to forward fan shaft with preformed packing under bolt heads).

D. Remove the bolts and preformed packings which secure the No. 1 bearing manifold to the inner diameter of the fan forward shaft. Retain preformed packings if serviceable.

E. Remove manifold using puller 2C6823 or 2C14871. Discard the preformed packings.

End SB GE 72-067.

4. Install No. 1 Bearing Manifold (Ref. Fig. 401)

A. Lubricate two new packings with engine oil and install them into packing grooves on manifold.

Pre SB GE 72-067 *** (No. 1 Bearing Manifold Assembly secured to forward fan shaft with bolts only).

B. Install manifold into ID of 1st-stage fan disk and fan forward shaft, conical end aft, aligning holes in manifold with captive nuts on the shaft.

C. Assemble bolts to captive nuts and TORQUE to between 33 and 37 lbf.in. (0.37 and 0.42 m.daN).

End Pre SB GE 72-067

SB GE 72-067 *** (No. 1 Bearing Manifold Assembly secured to forward fan shaft with preformed packings under bolt heads).

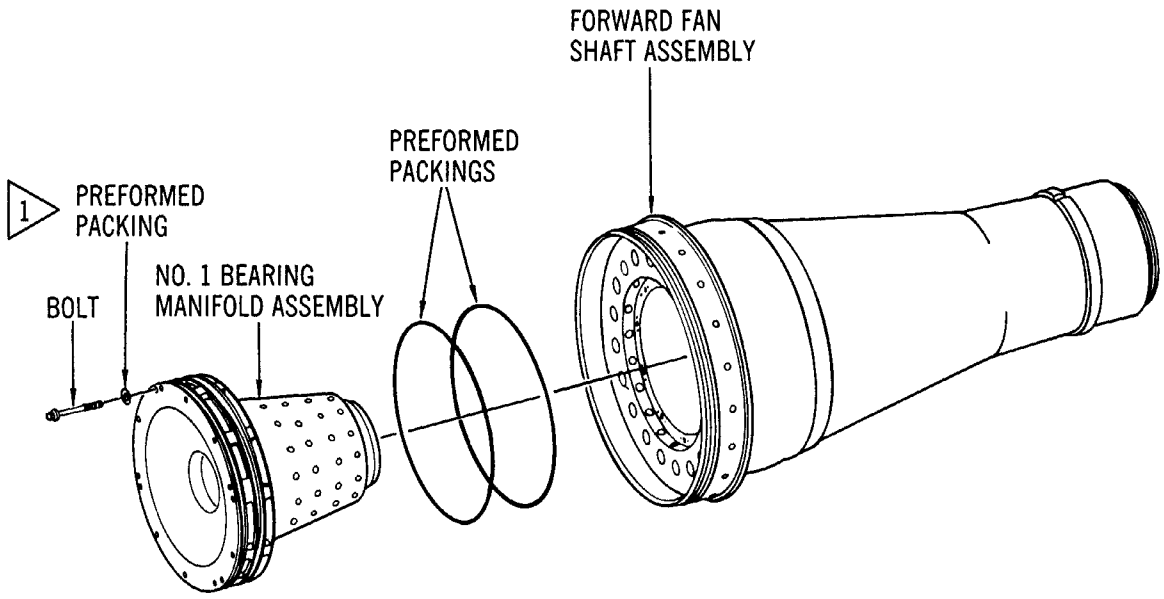
D. Install manifold into ID of 1st-stage fan disk and fan forward shaft, conical end aft, aligning holes in manifold with captive nuts on the shaft.

E. Install serviceable performed packings under each bolt head and assemble the bolts to the captive nuts and TORQUE to between 33 and 37 lbf.in. (0.37 and 0.42 m.daN).

End SB GE 72-067

F. Install fan rotor spinner (Ref. 72-21-00, P. Block 801).

1 ADD PREFORMED PACKING PER SB GE 72-067



1087053-00-A

BM5 72 21 01 4 LAMO - 00

No. 1 Bearing Manifold Assembly
Figure 401

FORWARD FAN CASE ASSEMBLY - DESCRIPTION AND OPERATION

1. General (Ref. Fig. 001)
   The basic forward fan case is made of aluminum with an Epoxy Graphite/aluminum honeycomb stiffening section. Containment is provided by a multiple layer Kevlar band around the stiffened casing. A laminated Kevlar/Epoxy cover protects the containment bands. The casing incorporates abradable microballoon tip shroud for the stage one fan blades. Acoustical panels are mounted on the inside diameter of the case.

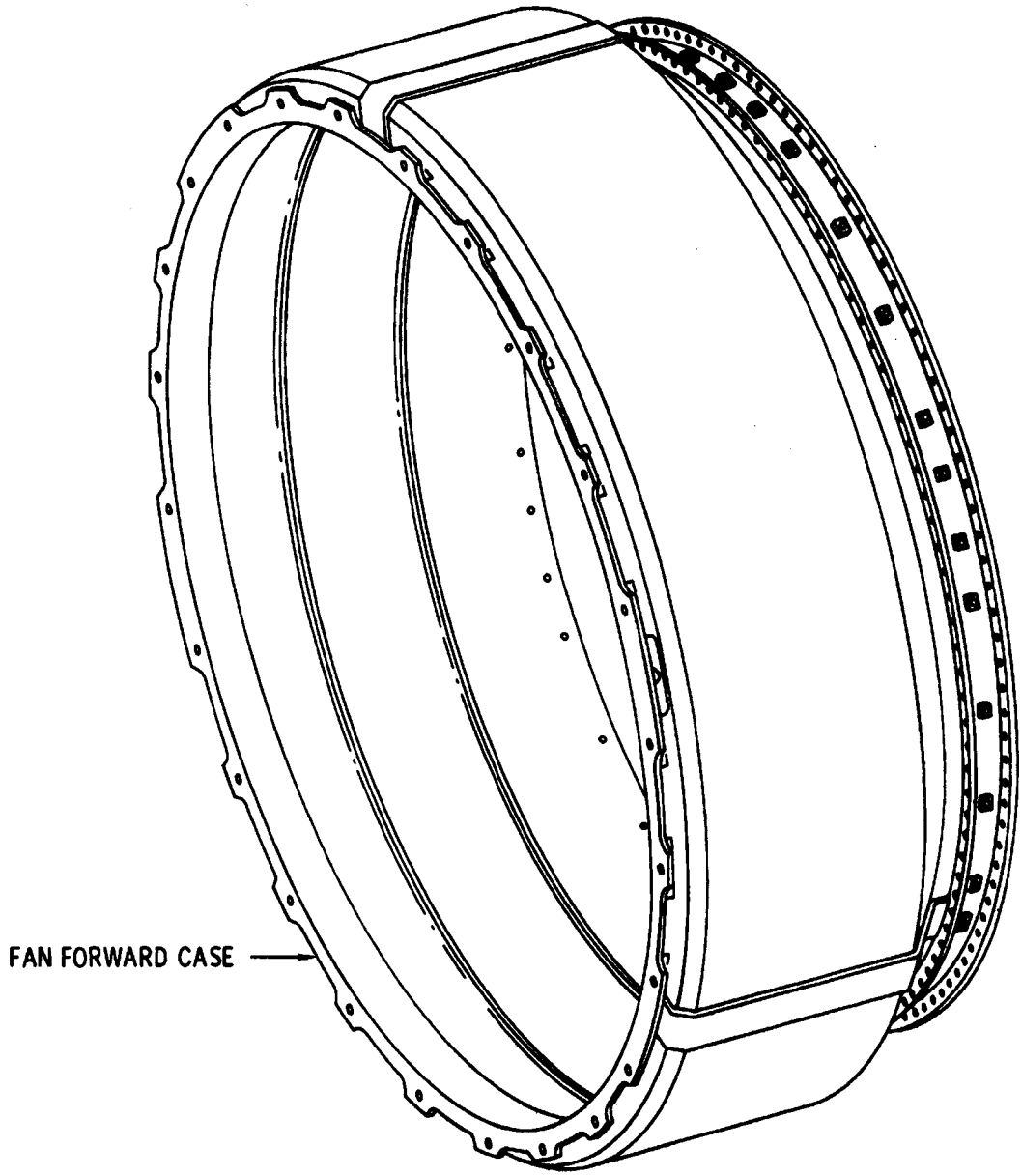
2. Functions
   The forward fan case performs the following primary functions :

   A. Provides for attachment of the engine inlet structure and the support and transmission of attachment loads from this point to the fan frame.

   B. Provides fan blade containment.

   C. Provides attachment points for acoustical panels.

   D. Provides an abradable microballoon shroud for fan blade tips.



BM5 72 22 00 0 LAMO 00

Forward Fan Case Assembly
Figure 001

FORWARD FAN CASE ASSEMBLY - INSPECTION/CHECK

1. General

A. This section provides information on the methods of inspecting the forward fan case assembly.

2. Forward Fan Case Assembly Inspection Check

A. Equipment and Materials

ITEM	DESIGNATION
Referenced Procedures	
- 72-00-00, P. Block 601	Engine - General
- 72-22-00, P. Block 801	Fan Frame Assembly

CAUTION : DO NOT PROCESS TITANIUM PARTS IN HALOGEN-CONTAINING COMPOUNDS IF CLEANING BEFORE INSPECTION IS NECESSARY.

B. Visually Inspect the Following : (Ref. Fig. 601)

INSPECTION/CHECK	MAX. SERVICEABLE LIMITS	REMARKS
(1)Fan Forward Casing for :		
(a)Cracks	One per every tenth bolt hole 0.030 in. (7.6 mm) long. None allowed in other areas	
(b)Nicks and scratches	Any number 0.10 in. (2.5 mm) deep with a min separation of 1 in. (25.4 mm) after removal of high metal	
(c)Dents	Any number with a smooth contour 0.20 in. (5 mm) deep	
(d)Loose or missing rivets and nuts	Not serviceable	Tighten loose nuts and replace missing rivets and nuts
(e)Damage to abradable material	Total loss of material not to exceed 80sq. in. (516 cm2) with no one area greater than 35 sq. in. (226 cm2), provided local areas are separated a distance equal to maximum dimension of adjacent void. Remaining area may have any amount of material loss provided blade tip maximum average clearance do not exceed 0.210 in. (5.33 mm)	Repair (Ref. 72-22-00, P. Block 801) Refer to 72-00-00, P. Block 601 for Over Serviceable Limit Extension
(f)Damage to Kevlar containment ring fiberglass cover	Not serviceable	Repair (Ref. 72-22-00, P. Block 801) Refer to 72-00-00, P. Block 601 for

INSPECTION/CHECK	MAX. SERVICEABLE LIMITS	REMARKS
		Over Serviceable Limit Extension
(g)Damage to Kevlar containment ring	Not serviceable	Not repairable
R (h)For fan cases without internal doublers - pre SB 72-0747; Corrosion 0.080 in. (2.03 mm) deep forward of the Kevlar containment. Maximum cumulative length - any amount.	Not serviceable	Visual corrosion less than or equal to 0.080 in. (2.03 mm) deep forward of the Kevlar containment, repair with the Approved Repairs (Ref. 72-22-00, P. Block 801) in 30 days of being found. At time of repair : Remove the forward inner acoustic panels at the 6:00 position and look for surface corrosion : - any amount less than 0.015 in. (0.38 mm) deep must be repaired by blending with use of polishing wheel ; then coat surface with epoxy primer paint (Material No. C03-007). - depth of corrosion greater than 0.015 in. (0.38 mm) not repairable. Refer to 72-00-00, P. Block 601 for Over-Serviceable

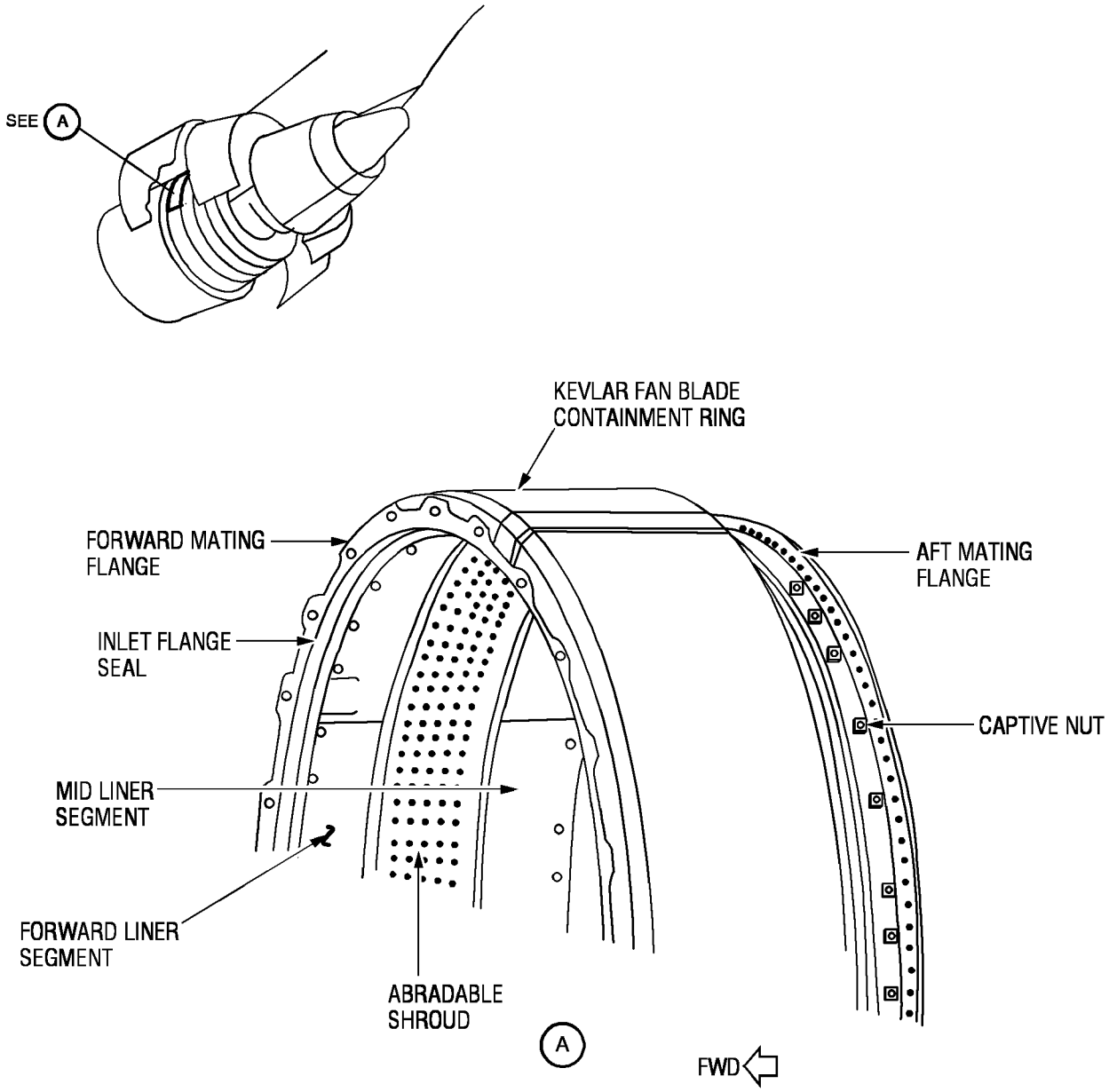
INSPECTION/CHECK	MAX. SERVICEABLE LIMITS	REMARKS
		Limit Extension
		- at rivet heads - not repairable. Refer to 72-00-00, P. Block 601 for Over-Serviceable Limit Extension.
		Visual corrosion greater than 0.080 in. (2.03 mm) deep forward of the Kevlar containment is not repairable Refer to 72-00-00, P. Block 601 for Over-Serviceable Limit Extension.
For fan cases with internal doublers - post SB 72-0747; Corrosion depth - any amount if there are no through-holes forward of the Kevlar containment. Maximum cumulative length - any amount.	Not serviceable	Repair with the Approved Repairs (Ref. 72-22-00, P. Block 801) in 30 days of being found. At time of repair : Remove the two lowest forward inner acoustic panels at the 6:00 position and look for surface corrosion around perimeter of doubler plates (Ref. NOTE).
		- any amount up to and including four doubler plates - serviceable at forward most doubler plate rivet heads -

INSPECTION/CHECK	MAX. SERVICEABLE LIMITS	REMARKS
		not repairable. Refer to 72-00-00, P. Block 601 for Over-Serviceable Limit Extension.
		- any amount at five or greater doubler plates - not repairable. Refer to 72-00-00, P. Block 601 for Over-Serviceable Limit Extension.

NOTE : (Ref. Fig. 602)

INSPECTION/CHECK	MAX. SERVICEABLE LIMITS	REMARKS
R (2)Liner Segments (Forward and Mid) for :		
NOTE : Whenever serviceable limits for the following items are exceeded, refer to the Over-Serviceable-Limit-Extension, if necessary.		
(a)Cracks	Not serviceable	Repair or replace (Ref. 72-22-00. P. Block 801).
(b)Nicks and scratches	Any number provided glass laminate does not exhibit broken fibers	
(c)Delamination	Not serviceable	Repair or replace panel (Ref. 72-22-00, P. Block 801).
(d)Missing pieces	Not serviceable	Repair or replace (Ref. 72-22-00, P. Block 801)
(e)Tears and cuts in surface	3 per panel in a fwd to aft direction with a maximum cumulative length of 3 in. (76.2 mm). Circumferential defects not serviceable	Repair or replace (Ref. 72-22-00, P. Block 801)
(f)Tears and cuts along leading edge surface coating	Not serviceable	Repair or replace (Ref. 72-22-00, P. Block 801)
(g)Loose bushings	Not serviceable	Replace panel (Ref.72-22-00, P. Block 801). Refer to

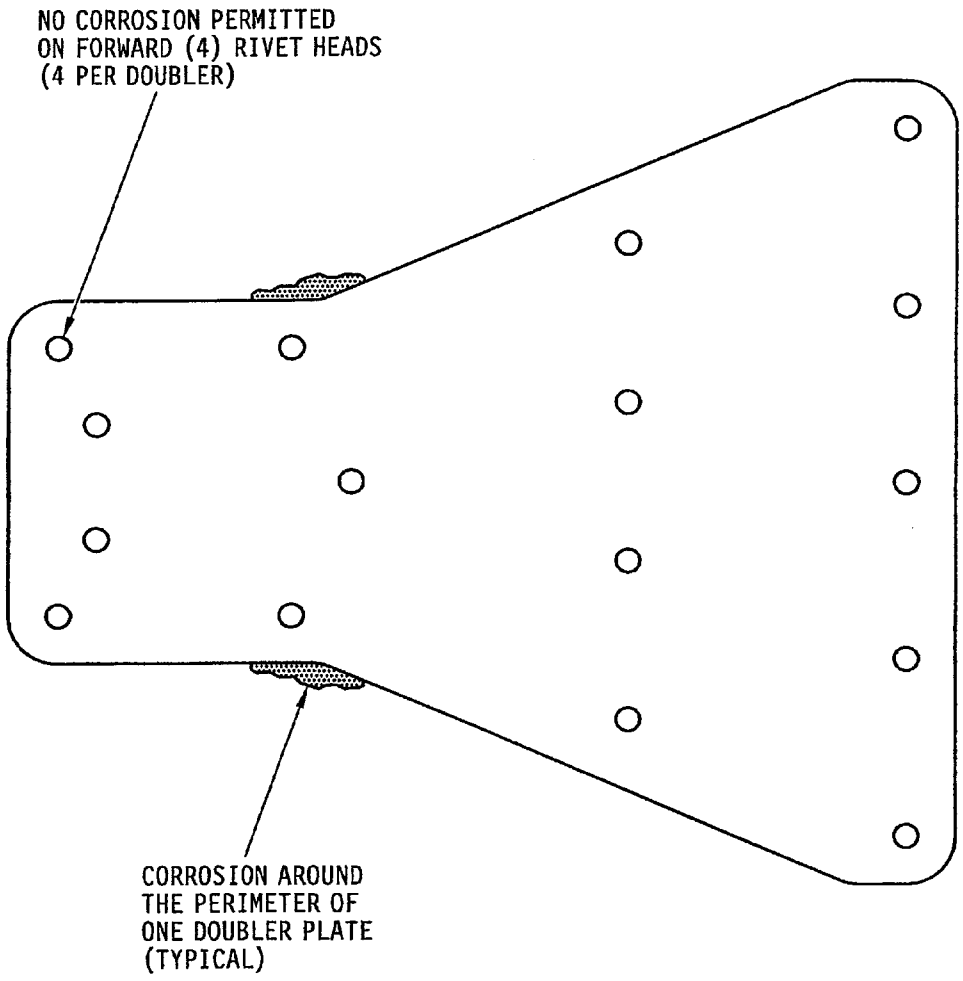
INSPECTION/CHECK	MAX. SERVICEABLE LIMITS	REMARKS
		72-00-00-, P. Block 601 for Over Serviceable Limit Extension
(h)Loose retaining screws	Not serviceable	Torque loose retaining screws to between 55 and 70 lbf.in. (0.62 and 0.79 m. daN) (Ref. 72-22-00, P. Block 801)



BM5 722200 6 LAM0 01

Forward Fan Case Assembly
Figure 601

R



1212279-00-A

BM5 72 22 00 6 LCM0 00

Corrosion Around Doubler Plates
Figure 602

R

1. Equipment and Materials

	ITEM	DESIGNATION
	A. Material No.C01-006	Adhesives, Plastics, Sealants (Ref. 70-00-00)
	B. Material No.C01-011	Adhesives, Plastics, Sealants (Ref. 70-00-00)
	C. Material No.C01-017	Adhesives, Plastics, Sealants (Ref. 70-00-00)
	D. Material No.C01-018	Adhesives, Plastics, Sealants (Ref. 70-00-00)
	E. Material No.C01-024	Adhesives, Plastics, Sealants (Ref. 70-00-00)
	F. Material No.C01-056	Adhesives, Plastics, Sealants (Ref. 70-00-00)
	G. Material No.C01-060	Adhesives, Plastics, Sealants (Ref. 70-00-00)
	H. Material No.C01-147	Adhesives, Plastics, Sealants (Ref. 70-00-00)
	I. Material No.C02-006	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
R	J. Material No.C03-081	Finishes and Protective Coatings (Ref. 70-00-00)
R	K. Material No.C03-082	Finishes and Protective Coatings (Ref. 70-00-00)
R	L. Material No.C03-084	Finishes and Protective Coatings (Ref. 70-00-00)
R	M. Material No.C03-085	Finishes and Protective Coatings (Ref. 70-00-00)
R	N. Material No.C04-001	Cleaning Compounds and Solvents (Ref. 70-00-00)
R	O. Material No.C04-002	Cleaning Compounds and Solvents (Ref. 70-00-00)
R	P. Material No.C04-003	Cleaning Compounds and Solvents (Ref. 70-00-00)
R	Q. Material No.C04-005	Cleaning Compounds and Solvents (Ref. 70-00-00)
R	R. Material No.C04-035	Cleaning Compounds and Solvents (Ref. 70-00-00)
R	S. Material No.C04-170	Cleaning Compounds and Solvents (Ref. 70-00-00)
R	T. Material No.C10-003	Miscellaneous (Ref. 70-00-00)
R	U. Material No.C10-008	Miscellaneous (Ref. 70-00-00)
R	V. Material No.C10-022	Miscellaneous (Ref. 70-00-00)
R	W. Material No.C10-040	Miscellaneous (Ref. 70-00-00)
R	X. Material No.C10-054	Miscellaneous (Ref. 70-00-00)
R	Y. Material No.C10-068	Miscellaneous (Ref. 70-00-00)
R	Z. Material No.C10-108	Miscellaneous (Ref. 70-00-00)
R	AA.Material No.C10-133	Miscellaneous (Ref. 70-00-00)

	ITEM	DESIGNATION
R	AB.Material No.C10-140	Miscellaneous (Ref. 70-00-00)
R	AC.Material No.C10-141	Miscellaneous (Ref. 70-00-00)
R	AD.Material No.C10-182	Miscellaneous (Ref. 70-00-00)
R	AE.Material No.C10-187	Miscellaneous (Ref. 70-00-00)
R	AF.MIL-C-85403 (TYPE II)	Cloth (Lint Free)
R	AG.2C6372	Heating Element
R	AH.	Film, Polyethylene
R	AI.	Abrasive Wheel, 2 inch (51 mm)
R	AJ.	Abrasive Wheel, 3 inch (76 mm)
R	AK.	Acrylic Spatula
R	AL.	Acrylic Wedge
R	AM.	Air Source - Clean, Filtered, Compressed Air
R	AN.	Cotton Swabs
R	AO.	PVC/Acrylic Scraper
R	AP.	Sponges
R	AQ.	Teflon Squeegee
	Referenced Procedures	
	- 71-13-00, P. Block 301	Cowl Doors
	- 72-21-00, P. Block 801	Fan Rotor Assembly

2. Forward Fan Case Assembly

Instructions provided in these procedures are for repair or replacement of damaged parts of the forward fan case assembly on an installed engine.

A. Repair Minor Damage to Liner Segments

(1)Make surface repairs as follows :

CAUTION : DO NOT CUT ALL THE WAY THROUGH THE PANEL TO BACK FACE. IT IS NOT NECESSARY AND CAN DAMAGE THE BACK FACE.

(a)Cut away damage area using a hole saw 1/8 in. to 1/4 in. (3.2 - 6.4 mm) larger diameter than damaged area, but not over 2 in. diameter (50.8 mm). Cut approximately one-half way through the thickness of the panel or until all damage is removed.

(b)Remove the damaged material inside the cut circle down to the bottom of the cut hole.

WARNING : CLEANING SOLVENTS ARE DANGEROUS. MAKE SURE YOU HAVE A GOOD FLOW OF AIR. DO NOT LET CLEANING SOLVENTS TOUCH YOUR EYES OR STAY ON YOUR SKIN REGULARLY AND/OR CONTINUOUSLY.

(c)Remove all loose particles, chips and dust. Blow gently with clean, filtered, compressor air. Clean repair area with solvent (C04-005) to remove all dirt, oil, grease and moisture.

(d)Place barrier sheet, such as wax paper, plastic film or aluminum foil, in the cut hole (to prevent the repair material from adhering to the back facing sheet).

(e)Prepare and apply microballoon material per section 70-43-15 of the Standard Practices Manual.

NOTE : Mix only as much material that can be conveniently applied within the set up time of the filler.

(f)Cure microballoon mixture at 135°F - 150°F (57°C - 66°C) for 1 hour.

(g)When partially cured, use a razor blade or sharp knife to trim the repair material to about 1/16 in. (0.6 mm) above or flush with the face sheet.
(h)When fully cured, file or sand the repair material flush with the surrounding surface of the face sheet.

(2)Make leading edge repair as follows :
(a)Cut away damaged and loose material from perforated face sheet leading edge and internal core structure using a hole saw, cut off disc or hand grinder (use approximately 10,000 RPM) or other suitable tool that will cut rather than tear away the material to be removed.
(b)Remove residue from the cutting operation using clean, dry, oil free compressed air and/or a vacuum.
(c)Thoroughly clean perforated face sheet using a clean cloth dampened with solvent (C04-005).
(d)Carefully examine perforated face sheet for evidence of delamination. None allowed.
(e)Using the cut off disc or hand grinder cut out all delaminated layers of the face sheet, cutting approximately 1/4 in. (6.4 mm) beyond delaminated material.
(f)Make cuts adjacent to and parallel with the ridges of the honeycomb core material to minimize damage to the ridges that provide support for the repair filler material.
(g)Remove the delaminated material in strips and sand foreign material from tops of honeycomb ridges, exposed edges of perforated face sheet and surfaces of the honeycomb core material using 180-240 grit sandpaper.
(h)Remove sanding residue by blowing with clean, dry, oil free compressed air or a vacuum.
(i)Clean all surfaces of the repair area, including under ledges, as much as possible to ensure adhesion of repair material, using solvent (C04-005).
NOTE : Black urethane coated surfaces may show traces of smudging on cloth after cleaning.
(j)Allow panel to dry completely.
(k)Mix and apply repair material per steps 2. A. (1) (e) thru 2. A. (1) (h) above.

(3)Replacement of liner segment
(a)Remove the spinner and fan blades (Ref. 72-21-00, P. Block 801). Remove only the number of blades required to gain access to the working area.
(b)Remove the Fan Stator Casing Acoustical Liners Segments as follows :
Using a razor blade or sharp knife, cut through the RTV between the axial and circumferential gaps of the liner segment.
Remove the panel(s) by loosening the 6 retaining screws which secure the panel(s) to the case and disengaging the panel from the case rails.
(c)Reinstall repaired liner segment or replacement liner segment as follows :
Coat the retaining screw threads with lubricant (C02-006).
CAUTION : DO NOT USE A HAMMER OR MALLET TO POSITION LINER SEGMENTS. ENSURE THAT THE BUMPERS OF EACH LINER SEGMENT FITS INTO THE CIRCUMFERENTIAL GROOVE OF THE CASE.
Install the liner segment panel(s) into the case engaging the rails.

NOTE : The tolerances on the molded liner segment and the liner-to-case fit often require that bumper material be removed to facilitate assembly of the liner segment into the case.
Bumper material may be removed as required with the use of a power motor and an abrasive sanding disc.

(d)TORQUE retaining screws to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN).

(e)Using black RTV compound (C01-006) or transparent RTV compound (C01-056), caulk the axial split lines between liner segments and the radial split lines between liner segments and fan case.

(f)Install spinner cone and fan blades removed in step 2. A. (3) (a) (Ref. 72-21-00, P. Block 801).

B. Plastic Abradable Material Repair

(1)Repair damaged abradable material as follows :

NOTE : Remove spinner and stage 1 fan blades as required (Ref. 72-21-00, P. Block 801).
Remove only the number of blades required to gain access to the working area.

(a)Remove all loose material using a hand scraper or grinder from the damaged area.

CAUTION : CARE MUST BE TAKEN TO PREVENT DAMAGE TO THE PLASTIC FACE SHEET UNDER THE SEAL MATERIAL. SEE NOTE BELOW.

(b)Route out remaining damaged material down to the plastic face sheet immediately under the abradable seal material leaving straight sided or slightly under cut edges of the cavity to form a retaining surface for new material. Remove all residual material from routed area.

(c)Lightly sand the plastic face sheet with 120-grit paper being careful not to cut the glass reinforcing fibers in the face sheet.

(d)Remove all loose particles, chips and dust. Blow with clean, filtered, compressed air. Clean repair area with solvent (C04-005) to remove all dirt, oil, grease and moisture.

NOTE : Damaged areas of 35sq. in. (226 cm^2) or greater, having total loss of material, the nomex core and fiberglass sheet (if damaged or loose) must be replaced.

(e)Replace honeycomb and fiberglass sheet as follows :

NOTE : Obtain Type HRH-10 Nomex Core Honeycomb Material from, General Electric Co., Commercial Engine Product Support, 111 Merchant Street Cincinnati Ohio 45246, USA.

1 Remove all loose material in the damaged area.
2 Route out remaining defective material down to the steel casing leaving straight sided or slightly undercut edges of the cavity to form a retaining surface for new material. Remove all residual material from the routed area.
3 Thoroughly clean repair area using solvent (C04-005) to remove all dirt, oil, grease and moisture. Blow dry using clean dry shop air.
4 Scuff sand bottom and edges of repair area using No.2 grit abrasive paper, a rotary file or grit blast with 200-mesh aluminum oxide grit.
5 Repeat step (3) being careful not to touch rework area with hands.
6 Mix and apply a film of adhesive (C01-011) to the repair area being assured of a good "WETTING OUT" of adhesive to casing.

NOTE : Effective working or "pot life" of adhesive is approximately 30 minutes.

7 Trim a piece of glass fabric (C10-003) approximately 1/8 in. (3.2 mm) smaller (on sides) than rework area and apply mixed adhesive (C01-011) to the glass fabric working the adhesive well into the glass fabric.

8 Position impregnated glass cloth against ID of casing and work well into adhesive.

9 Apply a second layer of adhesive per step (6) above the glass fabric installed in step (8).

10 Trim a piece of honeycomb (C10-008) to fit the rework area and press firmly into adhesive bed. Core must be applied within the 30-minutes pot life of adhesive. Hold light pressure 3-10 psi (0.20 - 0.69 bars) (recommended) against Honeycomb during cure cycle to insure adhesion to glass cloth.

NOTE : Nomex Core Honeycomb (C10-008) to be 3/8 in. (9.5 mm) cell size by 3/8 in. (9.5 mm) thick. Density to be 2.7 - 3.3. lb. per cu.ft. (43.2 - 52.9 kg/m³). Vapor degreased prior to insertion into casing. Use gloves when handling.

11 Cure adhesive using a heat gun, heat lamp or heating element, 2C6372, holding temperature at 79°C - 93°C (175°F - 200°F) for one hour or 54°C - 77°C (130°F - 170°F) for 2 hours.

12 Visually-inspect for positive bonding of honeycomb to the glass cloth by aiming a light into the cells at approximately a 60 degree angle from vertical. Check for light under the cell walls from the opposite angle. Up to 5 linear in. (127mm) of bad bond is repairable. Repair bad bond by laying a small bead of adhesive along the cell wall to glass cloth joint using a syringe and hypodermic needle.

(f) Prepare abradable seal material as follows :

WARNING : **DIETHYLENETRIAMINE IS TOXIC, AND CAN CAUSE SEVERE DERMATITIS AND PERMANENT TISSUE DAMAGE. HIGH CONCENTRATIONS OF VAPORS ARE IRRITATING TO THE EYES AND MUCOUS MEMBRANES. USE ADEQUATE VENTILATION, EYE AND SKIN PROTECTION, AND KEEP WORKING AREA THOROUGHLY CLEAN AT ALL TIMES. IF DIETHYLENETRIAMINE CONTACTS THE SKIN, WASH THOROUGHLY WITH SOAP AND WATER AT ONCE.**

1 Estimate quantity required and weigh sufficient quantities of each of the components in the following ratio :

Resin (C01-017)	98 - 100 parts by weight
Catalyst (C01-024)	9.5 - 10.5 parts by weight
Microballoons (C01-018)	20 - 28 parts by weight

2 Mix resin (C01-017) and catalyst (C01-024) thoroughly in a clean, oil free container. Add microballoons (C01-018) and mix until compound attains desired consistency for application.

NOTE : Materials and repair area temperature should be maintained at 70°F (21°C) minimum if possible.

(g) For minor local repairs, abradable compound is available in a tube kit (C01-060) ready for mixing. Mix resin and catalyst in the tube kit as follows :

1 Pull handle all the way out.

2 Insert rod into handle cavity, and break seal between resin and catalyst.

3 Push handle all the way in, and place tube kit on a portable mixer.

4 Insert driving spindle into handle cavity and mix compound for 3-5 minutes, moving tube up and down the handle during mixing.

5 Upon completion of mixing cycle, remove cap from opposite end of tube and use handle to force compound from tube.

NOTE : Compound may be mixed manually by running handle in and out of the tube for 15-20 minutes.

(h) Apply abradable seal material with a spatula and use a locally manufactured template to trowel in place. Force material into intimate contact with the surface to minimize entrapped air. Smooth surface flush with or slightly above the adjacent area.

NOTE : Template may be fabricated from any available material (0.060 in. (1.52 mm) min. thickness) to trowel the RSP-3 compound in place. The template should be contoured such that when the end points are resting on the metal surface just forward and aft of the abradable material, it will trowel the material being added to the repair area to provide a surface that will be the same average tip clearance as adjacent areas.

(i) Cure at room temperature (75°F/24°C) for 8 hours or at 66°C - 82°C (150°F - 180°F) for 2 hours.

(j) Sand the surface flush with the surrounding area, if required, using 80-grit paper.

(k) Visually inspect the repaired area for excessive voids. If defective, remove and replace.

(l) Audibly-check adhesion of abradable seal to the casing by tapping the seal with a steel rod approximately 3/8 in. (9.5 mm) diameter, 2 in. (51 mm) long with a rounded end. Use sufficient force to obtain degree of sound required. Loose area will have a "clicking" sound as compared to a "solid" sound for properly bonded areas. If defective, remove and replace.

(m) Install spinner cone and fan blades removed (Ref. 72-21-00, P. Block 801).

C. Repair the Containment Ring Outer Cover (Ref. Fig. 801)

(1) Open the fan cowl doors (Ref. 71-13-00, P. Block 301).

(2) Repair the forward fan case containment ring outer cover as follows :

(a) Use 120-180 grit abrasive cloth and hand-sand the damaged area to remove the resin glaze from the surface of the cover.

1 Make sure a rectangular patch will fit over the area and is larger than the sanded are 2.0-2.5 in. (50.8-63.5 mm) in all directions.

WARNING : CLEANING SOLVENTS ARE VERY FLAMMABLE, VOLATILE AND TOXIC. THEY SHOULD BE USED ONLY WITH SUFFICIENT VENTILATION. DO NOT BREATHE VAPORS AND AVOID REPEATED CONTACT WITH THE SKIN.

(b) Clean the sanded area with a clean cloth moist with Material No.C04-035.

1 Continue to clean until an area of cloth stays clean after you wipe the repair area.

2 Let the area air dry.

(c) Cut a piece of Material No.C10-003 to fit the damaged area.

(d) Cut a second piece of Material No.C10-003 that is 1.0 in. (25.4 mm) larger in width and length than the first piece.

(e) Put Material No.C10-003 pieces on a workbench or layup table covered

with clean, new polyethylene film.

WARNING : AVOID CONTACT OF EPOXY RESIN AND CATALYST WITH SKIN AND/OR EYES. USE ONLY WITH SUFFICIENT VENTILATION. WEAR CLEAN NYLON OR POLYETHYLENE FILM GLOVES WHEN YOU MIX OR APPLY ADHESIVE.

(f)Mix Material No.C01-147 in a clean uncoated paper or grease free metal container as follows :

1 Measure 100 parts by weight resin.

2 Add 19 parts by weight catalyst and mix fully.

NOTE : Minimum batch size should by 119 grams. Pot life after you mix the batch is 25 minutes.

(g)Use a clean brush (Material No.C10-108) to apply Material No.C01-147 on each side of the two Material No.C10-003 pieces.

1 Use a teflon squeegee to remove the excess Material No.C01-147 from each piece of Material No.C10-003.

(h)Lay the two pieces of Material No.C10-003 on a clean piece of teflon film.

1 Make sure the larger piece of Material No.C10-003 is against the tefon film.

(i)Bond the two Material No.C10-003 pieces together to form a patch.

1 Remove the wrinkles and the air from the patch with a teflon squeegee.

(j)Use a clean brush (Material No.C10-108) and apply a thin layer of Material No.C01-147 approximately 0.005 in. (0.13 mm) thick around the repair area.

(k)Put the patch with the teflon film over the damaged area.

1 Make sure to put the patch over the center of the damaged area.

(l)Use the teflon squeegee to remove the wrinkles and air from the patch.

(m)Let the patch cure for a minimum of eight hours before you remove the teflon film or move the case. Adhesive will cure fully in five to seven days.

(3) Close the fan cowl doors (Ref. 71-13-00, P. Block 301).

R D. Repair the Casing Shell Forward of the Kevlar Containment Ring for Corrosion

R (1)Open the fan cowl doors (Ref. 71-13-00, P. Block 301).

R (2)Remove the RTV bead from the damaged area with a PVC or acrylic scraper.

R (3)If you cannot see any corrosion, use RTV 103 (Material No.C01-006) in a sealant gun (Material No.C10-068) to replace the fillet of RTV.

R (a)Let the RTV cure for 24 hours.

R (4)If the corrosion is under the forward edge of the kevlar, trim back the kevlar as follows :

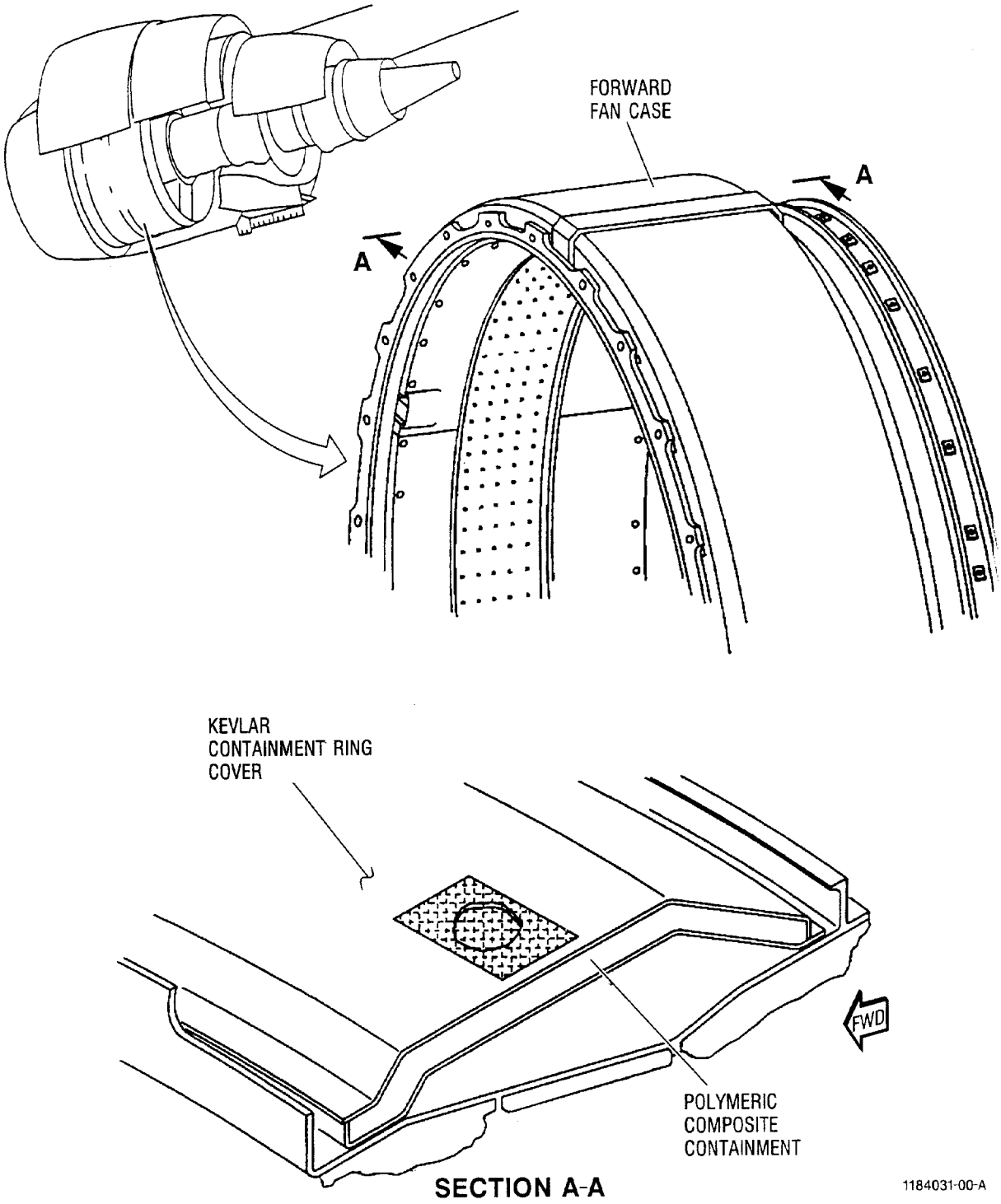
R (a)Do a local cut back of the kevlar.

R 1 Use a flexible 3 in. (76 mm) diameter abrasive wheel to make a parallel cut of the kevlar with the outer diameter surface of the casing.

R - Do not exceed Dim A and C limits. (Ref. Fig. 802).

R (b)Continue to trim the epoxy impregnated kevlar from the inside diameter until you expose the corrosion.

R 1 Do not exceed Dim A and C limits.



BM5 72 22 00 8 LAMO 00

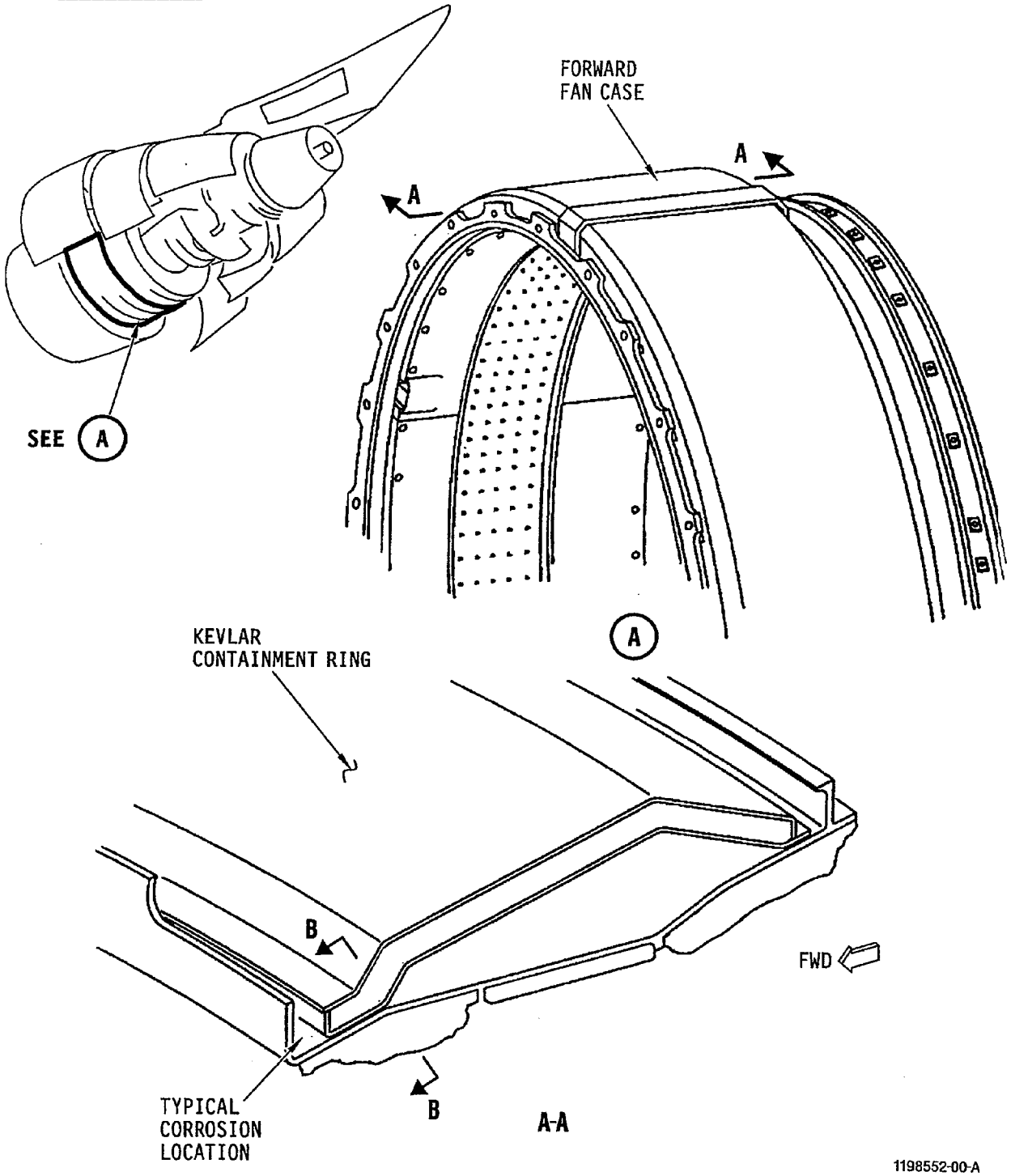
Forward Fan Case Containment Ring Outer Cover Repair
Figure 801

R (c)Use a 2 in. (51 mm) or 3 in. (76 mm) diameter abrasive wheel to cut back the kevlar to the start of the graphite edge.
R 1 Do not exceed Dim A and C limits.
R (d)To help find and remove the accessible corrosion you can use an acrylic spatula or wedge to lift up the kevlar.
R (e)Blend to remove the accessible corrosion. Corrosion that is inaccessible after the allowable cutback of the Kevlar is allowed provided all other conditions of the repair are met.
R 1 Do not cut the carbon fiber ply.
R (f)Etch blended areas (Ref. 70-00-00, P. Block 201).
R (g)Do a spot fluorescent penetrant inspection (Ref. 70-00-00, P. Block 201).
R 1 To remove residue, use the wipe method only.
R 2 Do not spray or soak with solvent.
R (h)Measure the depth of the blended area (Dim B).
R 1 For fan cases without internal doublers;
R - If the depth of the blended area is less than 0.080 in. (2.03 mm), continue with this repair.
R - If the depth of the blended area is more than 0.080 in. (2.03 mm), you cannot repair the forward fan case with this repair (see the Over-Serviceable-Limit Extensions).
R 2 For fan cases with internal doublers;
R - If the depth of the blended area is less than a through-hole, continue with this repair.
R - If the depth of the blended area is a through-hole, you cannot repair the forward fan case with this repair (see the Over-Serviceable-Limit Extensions).
R (i)Do an inspection of the trimmed area of the kevlar for moisture.
R 1 If the kevlar is not dry, dry the cut back kevlar at 180°F (82°C) for three hours, using a heat gun (Material No.C10-054).
R (j)Seal the trimmed surface of the kevlar and carbon fiber plies as follows :
R 1 Prepare the liquid adhesive (Material No.C01-147).
R WARNING : DO NOT LET THE EPOXY RESIN AND THE CATALYST TOUCH YOU. MAKE SURE YOU HAVE A GOOD FLOW OF CLEAN AIR. USE CLEAN NYLON FILM, LATEX OR POLYETHYLENE GLOVES (MATERIAL NO.C10-140) WHEN YOU PREPARE AND APPLY THE ADHESIVE. THIS MATERIAL IS FLAMMABLE AND DANGEROUS TO YOUR SKIN, EYES AND LUNGS.
R WARNING : DO NOT MIX QUANTITIES MORE THAN 250 GRAMS. DANGEROUS HEAT BUILD-UP CAN OCCUR AND CAUSE UNCONTROLLED DECOMPOSITION OF THE MIXED ADHESIVE. TOXIC FUMES CAN OCCUR AND CAUSE PERSONAL INJURY.
R CAUTION : IF THE ADHESIVE HAS BEEN STORED BELOW ROOM TEMPERATURE, MAKE SURE THAT THE ADHESIVE IS AT ROOM TEMPERATURE BEFORE THE CONTAINER IS OPENED.
R - Make an estimate of the quantity of liquid adhesive (Material No.C01-147) needed.
R - Prepare the liquid adhesive (Material No.C01-147) in a clean metal or uncoated paper container.
R - Weigh out sufficient quantities of each of the components in the

R ratio that follows :
R . Part A (blue color) - 100 parts by weight
R . Part B (amber color) - 30 parts by weight.
R - Mix Part A and Part B until no streaks of the two components can be
R seen.
R - Add up to 5 percent by weight of fumed silica additive
R (Material No.C10-022) to the mixed adhesive to prevent runs
R and drips.
R 2 Apply the mixed adhesive to the trimmed surface of the kevlar and
R carbon fiber plies with a disposable brush (Material No.C10-108).
R - The pot life of the liquid adhesive will be approximately
R 75 minutes.
R 3 Apply sufficient adhesive to completely cover the surface and seal
R all loose fibers.
R - Make sure that the adhesive covers the joint between the kevlar and
R carbon fiber plies.
R **WARNING : ISOPROPYL ALCOHOL IS TOXIC AND FLAMMABLE. USE PERSONAL**
R **PROTECTION EQUIPMENT. USE IN A WELL-VENTILATED AREA.**
R 4 Use a clean cloth (Material No.C10-182) moist with isopropyl alcohol
R (Material No.C04-035) to remove all unwanted adhesive.
R **WARNING : USE THERMAL GLOVES WHEN YOU MOVE OR TOUCH HOT OR COLD PARTS.**
R **HOT OR COLD PARTS CAN CAUSE INJURY.**
R 5 Cure the adhesive for one hour at 160° to 180°F (71° to 82°C)
R or five days at room temperature.
R (5)Prepare the surface of the kevlar cover around the trimmed area and on
R the adhesive surface of the trimmed area as follows :
R (a)Use 120-180 grit abrasive paper (Material No.C10-141) with your hand,
R to lightly rub the surface of the kevlar cover around the trimmed area
R and on the adhesive surface of the trimmed area to make the surface
R rough.
R NOTE : The sanded area must be large enough to let a rectangular repair
R patch extend 2.0-2.5 in. (51-63 mm) beyond the trimmed area and
R to the forward edge of the kevlar.
R **WARNING : USE EYE PROTECTION WHEN YOU USE COMPRESSED AIR TO CLEAN,**
R **COOL, OR DRY PARTS OR TOOLS. PARTICLES CAN CAUSE AN INJURY**
R **TO YOUR EYES. DO NOT USE MORE THAN 30 PSI (207 KPA). DO NOT**
R **POINT COMPRESSOR AIR AT YOURSELF OR OTHER PERSONS.**
R (b)Blow remaining dust away with shop air.
R (c)Clean the sanded area as follows :
R 1 Get some cloths (Material No.C10-182).
R **WARNING : SOLVENTS ARE VOLATILE, TOXIC, AND HIGHLY FLAMMABLE. USE ONLY**
R **WITH SUFFICIENT VENTILATION AND AVOID EYE CONTACT OR**
R **REPEATED OR PROLONGED CONTACT WITH THE SKIN.**
R 2 Get MEK (Material No.C04-001), MIBK (Material No.C04-170), acetone
R (Material No.C04-003), or isopropyl alcohol (Material No.C04-035).
R 3 Put solvent on a cloth (Material No.C10-182) to make the cloth
R moist.
R - Do not use so much solvent that drops of solvent fall from the
R cloth.
R 4 Move the first cloth lightly in one direction across the part that
R is to be cleaned.

R 5 Use a second dry cloth to wipe the part before the solvent on the part dries.
R - Move the second cloth in the same direction as the first cloth.
R 6 Do this procedure until a clean part of the cloth stays clean.
R 7 Do the last wipe with a clean dry cloth before the solvent on the part dries.
R 8 Use cotton swabs in the small areas to make sure that all areas are clean.
R 9 Let the part dry a minimum of 15 minutes.
R (6)Apply Teflon tape (Material No.C10-040) to the edge of the kevlar and carbon fiber plies.
R (7)Apply alodine chemical touch-up to all the blended areas and any areas where the primer on the aluminum has been damaged (Ref. 70-00-00, P. Block 201).
R (a)Use sponges or cotton swabs that are moist, but do not drip. Do not let the solution touch the kevlar.
R (8)Wait 30 minutes for the alodine to become hard.
R (9)Remove the teflon tape.
R (10)Apply epoxy-fiberglass patch to the repair area as follows :
R (a)Cut out a piece of fiberglass cloth (Material No.C10-003) to fit the sanded repair area.
R (b)Cut out a second piece of fiberglass cloth (Material No.C10-003) to be approximately 1.0 in. (25 mm) smaller in width and length than the first piece.
R (c)Lay the fiberglass cloth pieces on a workbench or lay-up table covered with a clean, new polyethylene film.
R (d)Prepare the liquid adhesive (Material No.C01-147) as follows :
R WARNING : DO NOT LET THE EPOXY RESIN AND THE CATALYST TOUCH YOU. ALSO, MAKE SURE YOU HAVE A GOOD FLOW OF CLEAN AIR. USE CLEAN NYLON FILM, LATEX OR POLYETHYLENE DISPOSABLE GLOVES (MATERIAL NO.C10-140) WHEN YOU PREPARE AND APPLY THE ADHESIVE. THIS MATERIAL IS FLAMMABLE AND DANGEROUS TO YOUR SKIN, EYES, AND LUNGS.
R WARNING : DO NOT MIX QUANTITIES MORE THAN 250 GRAMS. DANGEROUS HEAT BUILD-UP CAN OCCUR AND CAUSE UNCONTROLLED DECOMPOSITION OF THE MIXED ADHESIVE. TOXIC FUMES CAN OCCUR AND CAUSE PERSONAL INJURY.
R CAUTION : IF THE ADHESIVE HAS BEEN STORED BELOW ROOM TEMPERATURE, MAKE SURE THAT THE ADHESIVE IS AT ROOM TEMPERATURE BEFORE THE CONTAINER IS OPENED.
R 1 Make an estimate of the quantity of liquid adhesive needed.
R 2 Prepare the liquid adhesive (Material No.C01-147) in a clean metal or uncoated paper container.
R 3 Weigh out sufficient quantities of each of the components in the ratio that follows :
R - Part A (blue color) - 100 parts by weight
R - Part B (amber color) - 30 parts by weight.
R 4 Mix Part A and Part B until no streaks of the two components can be seen.
R 5 Add up to 5 percent by weight of fumed silica additive (Material No.C10-022) to the mixed adhesive to prevent runs and drips.

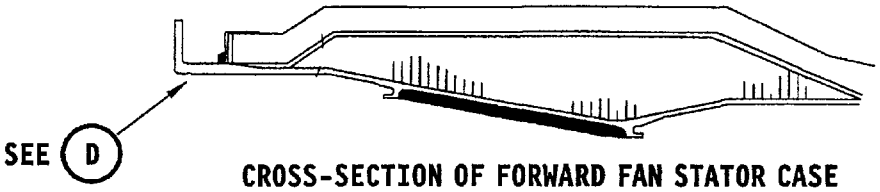
R - Pot life of liquid adhesive will be approximately 75 minutes.
R (e)Wet the fiberglass cloth with the adhesive as follows :
R 1 Put the mixed epoxy adhesive on each fiberglass cloth piece and push the adhesive into the cloth with a disposable brush (Material No.C10-108).
R 2 Wipe across each side with a teflon squeegee to remove excess adhesive.
R (f)Assemble the adhesive coated fiberglass pieces to make a 2-ply patch as follows :
R 1 Put the larger piece of glass cloth on a clean, new piece of FEP polymer film (Material No.C10-133).
R 2 Put the smaller piece of glass cloth on top of the first piece.
R - Put the edge that will be at the aluminum case to the kevlar joint on top of the same edge of the first piece.
R 3 Use a teflon squeegee and push the fiberglass pieces together to remove wrinkles and air bubbles.
R 4 Use a disposable brush (Material No.C10-108) with stiff bristles to brush a thin coat of mixed adhesive (Material No.C01-147) approximately 0.005 in. (0.13 mm) thick to cover the repair area.
R 5 Put the 2-ply patch with FEP polymer film on the repair area of the cover.
R - Make sure the patch is centered over the trimmed area and level with the joint between the kevlar and the aluminum case (Ref. Fig. 802).
R 6 Use a teflon squeegee to push the patch against the cover to remove wrinkles and air bubbles.
R 7 Let the patch cure for eight hours minimum before you remove the teflon film or touch the case.
R - Complete cure of adhesive will occur in five to seven days or in one hour at 180°F (82°C).
R (11)Alodine and prime as follows :
R (a)Apply chemical touch-up to any areas where the coating on the aluminum has been damaged. (Ref. 70-00-00, P. Block 201).
R Chemical touch-up surface refinishing process for aluminum :
R 1 Use sponges or cotton swabs that are moist but do not drip.
R 2 Do not let the solution touch the kevlar.
R (b)Wait 30 minutes for the alodine to become hard.
R (c)Apply primer (Material No.C03-085) to all areas that have had alodine applied during the repair.
R 1 Total primer thickness must be 0.001-0.003 in. (0.03-0.08 mm).
R 2 Wait 30 minutes between applications.
R (12)Use RTV 103 (Material No.C01-006) in a sealant gun (Material No.C10-068) to replace the fillet of RTV. Let the RTV cure for 24 hours.
R (13)Close the fan cowl panels (Ref. 71-13-00, P. Block 301).



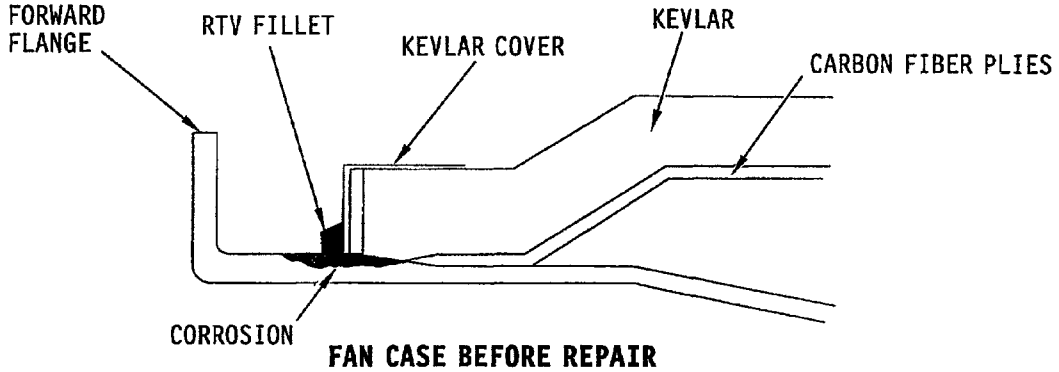
BM5 72 22 00 8 LCMA 00

Forward Fan Case Corrosion Location
(Sheet 1/2)
Figure 802

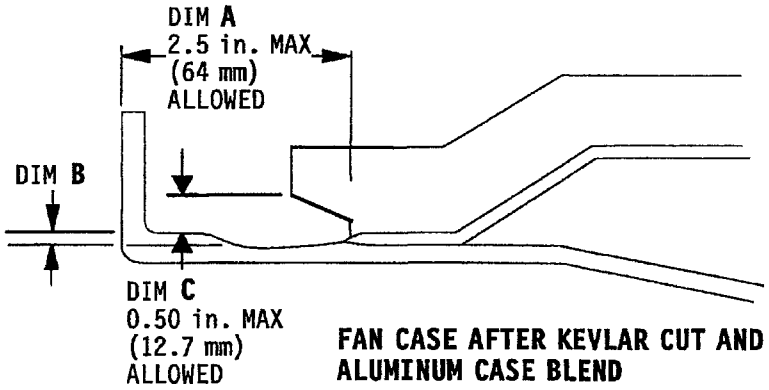
R



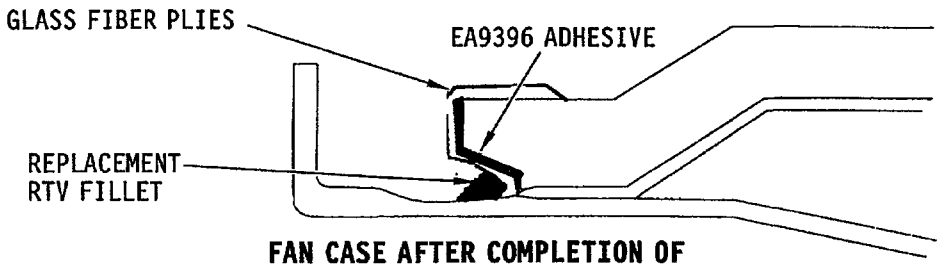
CROSS-SECTION OF FORWARD FAN STATOR CASE
B-B



FAN CASE BEFORE REPAIR



FAN CASE AFTER KEVLAR CUT AND ALUMINUM CASE BLEND



FAN CASE AFTER COMPLETION OF THE REPAIR

(D)

1198553-00-A

BM5 72 22 00 8 LCMC 00

Forward Fan Case Corrosion Location
(Sheet 2/2)
Figure 802

R

FAN FRAME AND CASE ASSEMBLY - DESCRIPTION AND OPERATION

1. General (Ref. Fig. 001)
The fan frame and case assembly is a two piece major structural member. Structural support is accomplished through 12 equally spaced radial struts of the fan frame. The fan aft stator case provides a means of attaching the fan reverser as well as the mounting of the oil tank, power management control, ignition boxes and instrumentation.

2. Functions
The fan frame and case perform the following primary functions :

A. An inlet airflow path to the core engine.

B. A support for loads of the fan stator, fan rotor and fan reverser.

C. Containment of accessory drive power take off gearing and shaft.

D. A variable bypass valve system.

E. Housing for service lines for lubrication of bearings, inlet gearbox and scavenge of the "A" sump.

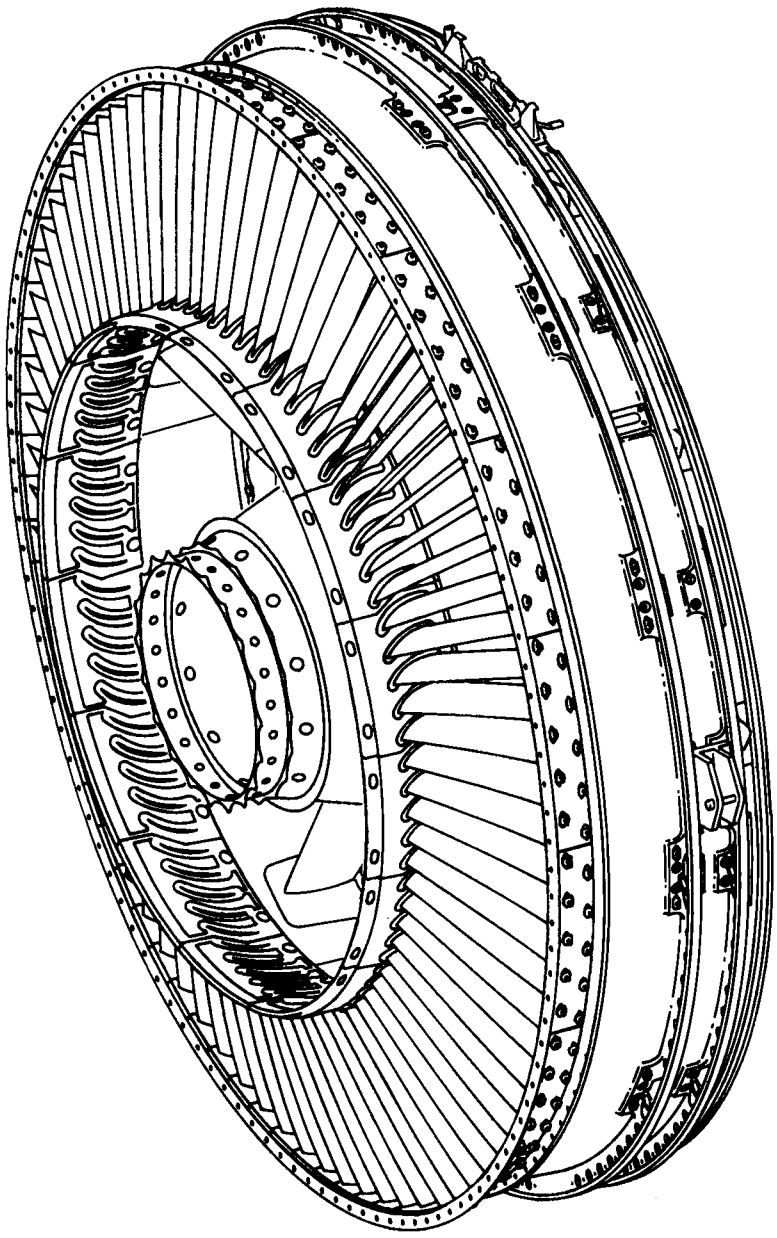
F. An airflow splitter to separate total fan airflow into fan discharge and core engine inlet airflow.

3. Structures

A. Fan Frame
The fan frame inner ring, or hub, is made of a one piece casting forming the core engine air inlet and to provide a smooth transition from fan exit to core engine inlet. The hub includes mounting rings for the No. 1, No. 3 bearings and inlet gearbox. The No. 2 bearing is bolted to the No .1 bearing housing. The frame provides support for the high pressure compressor, fan rotor, fan stator, radial driveshaft housing, inlet and transfer gearboxes, front engine mount and fan reverser.
Air extraction features are incorporated for sump pressurization and ventilation as well as core compartment, high and low pressure turbine, and integrated drive generator cooling. A variable bypass valve system is incorporated to establish proper airflow matching between the fan rotor and compressor rotor providing excellent stall margin and engine operating characteristics. The bypass valves are activated by a unison ring and bellcranks which are actuated by two fuel operated hydraulic actuators.

B. Aft Fan Stator Case
The aft fan stator case is made of lightweight aluminum. It is bolted to the outer strut ends of the fan frame and rabbeted into the mating flange of the forward fan stator case. Radial outlet guide vanes are bolted at their outer ends to the aft fan stator case and at their inner ends are inserted into pockets of the sleeve panels of the inner flow path. Support

of the fan reverser is provided through seating surfaces at the aft edge of the case. A bulb seal and an inflatable seal attached to the aft end of the fan case is provided to prevent fan air leakage from between the fan case and the fan reverser cowl.



BM5 72 23 00 0 LAM0 00

Fan Frame and Case Assembly
Figure 001

FAN FRAME AND CASE ASSEMBLY - INSPECTION/CHECK

1. Fan Frame and Case Assembly

A. General

CAUTION : DURING ENGINE SHUTDOWN THE BYPASS VALVES ARE IN THE OPEN POSITION. TAKE PRECAUTIONS WHEN WORKING IN THE FAN AREA TO PREVENT OBJECTS FROM FALLING THROUGH THE VALVE OPENINGS INTO THE INTERNAL CAVITY OF THE FAN FRAME.

Maintenance of the fan frame when the engine is installed in the aircraft is limited to external areas and those areas accessible through the fan reverser. To perform internal maintenance the fan frame must be removed. It is recommended that the frame be removed with the complete engine.

B. Equipment and Materials

ITEM	DESIGNATION
(1)Material No.C01-006	Adhesives, Plastics, Sealants (Ref. 70-00-00)
(2)Material No.C01-106	Adhesives, Plastics, Sealants (Ref. 70-00-00)
R (3)Material No.C03-081	Finishes and Protective Coatings (Ref. 70-00-00)
R (4)Material No.C03-082	Finishes and Protective Coatings (Ref. 70-00-00)
Referenced Procedures	
- 72-00-00, P. Block 601	Engine - General
- 72-23-00, P. Block 801	Fan Frame and Case Assembly

C. Procedure

Visually inspect the following. Confirm suspected cracks using spot fluorescent penetrant inspection.

NOTE : Pitting in the fan frame hub is acceptable provided the pitting is from the casting process, 0.060 inch (1.52 mm) or less in diameter, and separated by 2 times the diameter of the pits.

NOTE : (Ref. Fig. 601) applies to step (4) (c).

INSPECTION/CHECK	MAX. SERVICEABLE LIMITS	REMARKS
(1)Hub Structure for :		
(a)Cracks	Any number weld cracks 0.12 in. (3 mm) long with a minimum separation of 2 in. (50.8 mm). Parent metal cracks not allowed	
(b)Dents	Any number smooth contour dents, 0.12 in. (3 mm) deep with a minimum separation of 2 in. (50.8 mm)	
(c)Corrosion	Any amount provided there is no	

INSPECTION/CHECK	MAX. SERVICEABLE LIMITS	REMARKS
(Discoloration)	associated scaling or pitting	
(2)Bypass Valve for :		
(a)Cracks	Not serviceable	Replace bypass valve (Ref. 72-23-00. P. Block 801)
(b)Nicks and scratches	Any amount 0.02 in. (0.5 mm) deep, with a min separation of 0.25 in. (6.4 mm) after removal of high metal	
(c)Missing rivets	Not serviceable	Replace bypass valve (Ref. 72-23-00, P. Block 801)
(d)Cuts and tears in valve seal	Not serviceable	Replace bypass valve Ref. 72-00-00, P. Block 601 for Over Serviceable Limit Extension
(3)Bypass Valve Clevis and Bellcranks for :		
(a)Loose and missing bolts and nuts	Not serviceable	Tighten loose bolts/nuts and replace missing bolts and nuts
(4)Fan frame struts for : (see corresponding figure).		
(a)Cracks	Any number weld cracks 0.12 in. (3 mm) long that do not extend into parent metal with a minimum separation of 2 in. (50.8 mm). Any number parent metal cracks 0.06 in. (1.5 mm) long with a minimum separation of 6 in. (152 mm)	
(b)Dents	Any number with a smooth contour 0.12 in. (3 mm) deep, with a min separation of 2 in. (50.8 mm)	
(c)Nicks and	Area "A" any number 0.03 in.	

INSPECTION/CHECK	MAX. SERVICEABLE LIMITS	REMARKS
scratches	(0.8 mm) deep 0.5 in. (12.7 mm) long, with a min separation of 0.5 in. (12.7 mm). Area "B", one per square in area 0.015 in. (0.4 mm) deep, 0.5 in. (12.7 mm) long	
(5)Aft Case Inner Liner Segments NOTE : Whenever serviceable limits for the following items are exceeded, refer to the Over-Serviceable-Limit-Extension, if necessary.		
(a)All areas (except wire mesh) for :		
1 Cracks	Not serviceable	Repair liner (Ref. 72-23-00, P.Block 801) if not greater than 2.0 inches (51 mm) otherwise replace panel (Ref. 72-23-00, P. Block 801).
2 Nicks, dents and scratches	Any number provided glass laminate does not exhibit broken fibers	
3 Missing pieces	Not serviceable	Repair liner (Ref. 72-23-00, P. Block 801)
4 Delamination	Not serviceable	Repair liner (Ref. 72-23-00, P. Block 801)
5 Dents in liner facesheet	Permitted if there are no tears or unbonded areas in the liner	
(b)Wire mesh for :		
1 Tears, cut and delamination	Not serviceable	Remove loose material, solvent clean repair area and apply adhesive (C01-106). Press edges of loose wire mesh into adhesive.

INSPECTION/CHECK	MAX. SERVICEABLE LIMITS	REMARKS
		Cure for 1 hour at 175°-200°F (79-93°C).
2 Nicks and scratches	Any number provided mesh does not exhibit broken strands.	
3 Missing pieces	Any amount	Remove loose material, solvent clean repair area and apply adhesive (C01-106) press edges of loose wire mesh into adhesive. Cure for 1 hour at 175°-200°F (79-93°C).
(6)Service Tubes and Connections for :		
(a)Cracks	Not serviceable	
(b)Nicks and scratches	Any number 0.010 in. (0.25 mm) deep, after removal of high metal provided defect does not extend completely across mating (sealing) surface	
(c)Dents	Any number smooth contour dents 0.06 in. (1.5 mm) deep. Contour rate shall not exceed 0.010 in. (0.25 mm) per in.	
(7)Casing for :		
(a)Cracks	One 0.25 in. (6.4 mm) long every tenth bolt hole in fwd flange. One 0.25 in. (6.4 mm) long every fifth lightning hole in casing rib	Repair (Ref. 72-23-00, P. Block 801)
(b)Cracks in ribs adjacent to ground handling mounts	Repair any number if the sum of the lengths of all individual cracks on each side of the fan case is not more than 10 in. (254 mm) per side. 10 cumulative inches is permitted on the left side of the fan case	Repair (Ref. 72-23-00, P. Block 801)

	INSPECTION/CHECK	MAX. SERVICEABLE LIMITS	REMARKS
		and 10 cumulative inches is permitted on the right side of the fan case.	
	(c)Dents	Any number with a smooth contour 0.19 in. (4.8 mm) deep with min. separation of 4 in. (102 mm)	
	(d)Nicks, scratches and gouges	Any number 0.03 in. (0.8 mm) deep, with a min. separation of 1 in. (25 mm) after removal of high metal	
	(e)Loose or missing nuts and rivets	Not serviceable	Tighten or replace nuts and rivets
	(f)Distortion	Acceptable provided proper assembly can be made	
	(g)Corrosion, discoloration Aft fan case corrosion (scales or pits)	Any amount provided there is no associated scaling or pitting Not permitted. Blend any amount less than 0.015 in. (0.38 mm) deep to remove corrosion (it may be necessary to remove acoustic panels and respective nut plates to gain access to all of the corroded area). Apply Alodine (C00523) to the repair area.	
	(h)Missing paint	Any amount	
	(8)Inner and Outer Fan Reverser Support Ring for :		
R	(a)Missing wear coating	Not serviceable	Repair up to 15% of the coating if no individual area is more than 4 in. (102 mm) in length (Ref. 72-23-00, P. Block 801).
R	(b)Corrosion in the area of missing	Not serviceable	Repair up to 15% of area if no

	INSPECTION/CHECK	MAX. SERVICEABLE LIMITS	REMARKS
R	coating		individual area is more than 4 in. (102 mm) in length. Blend to remove corrosion up to 0.020 in. (Ref. 72-23-00, P. Block 801). See 72-00-00, P. Block 601 for Over Serviceable Limits Extension
R	(c)Corrosion in the area not normally covered by wear coat	Not serviceable	Repair up to 15% of area if no individual area is more than 4 in. (102 mm) in length. Blend to remove corrosion up to 0.020 in. in depth followed by applying Alodine (C03-081 or C03-082) to the repair area. See 72-00-00, P. Block 601 for Over Serviceable Limits Extension
R	(d)Nicks, dents and scratches on the top edge of the ring	Permitted, two signs of damage if they are less than 2.5 in. (64 mm) in length and 0.13 in. (3.3 mm) in depth. No cracks allowed.	Blend to remove sharp edges to less than 0.25 in. (6.4 mm) in height. Apply Alodine to the repair. See 72-00-00, P. Block 601 for Over Serviceable Limits Extension
R	(e)Nicks, dents and scratches in the parent metal in areas other than the top of the ring	Permitted, maximum 0.020 in. (0.50 mm) in depth after removal of sharp edges	Blend to remove sharp edges to maximum 0.050 in. (12.7 mm) in depth and 0.50 in. (1.27 mm) in

INSPECTION/CHECK	MAX. SERVICEABLE LIMITS	REMARKS
		length. Apply Alodine to the repair. See 72-00-00, P. Block 601 for Over Serviceable Limits Extension
(9)Bumper Assembly - Deflection Limiter for :		
(a)Cracked or missing	Not serviceable sleeve(s)	Replace sleeve(s)
(b)Freedom of movement (laterally by rotating)	Not serviceable	Replace Bumper Assembly
(10)Forward Engine Mount and Mount Link for :		
(a)Cracks	Not serviceable	
(b)Nicks, dents and scratches	Three every 4 sq. in. (25.8 cm2), 0.030 in. deep. Scratches not to exceed one in. (25.4 mm) in length	Blend
(c)Fretting, pickup and high metal	Any amount 0.003 in. (0.08 mm) deep after removal of high metal	Blend
(d)Damaged pylon mount nuts	Not serviceable	Replace nuts
(11)Outer Outlet Guide Vanes for :		
(a)OGV's without or missing metal leading edges (and without speed tape applied to leading edges) for :		
1 Nicks, scratches, and gouges on the concave/convex airfoil surface	Permitted, if the defects are less than 0.04 in. (1.0 mm) in depth. No sharp groves are permitted.	Replace vane (Ref. 72-23-00, P. Block 801). See 72-00-00, P. Block 601 for Over Serviceable Limits Extension
2 Missing polyurethane coating	Any amount	Remove loose polyurethane coating
NOTE : All the defects on a side must have a minimum separation of		

INSPECTION/CHECK	MAX. SERVICEABLE LIMITS	REMARKS
	1.0 in. (25 mm). No back-to-back defects are permitted (for example, defects on both sides of the airfoil in the same location).	
3 Dents (all areas of the OGV)	Permitted with a smooth contour, if not more than 0.07 in. (1.8 mm) in depth	Replace vane (Ref. 72-23-00, P. Block 801). See 72-00-00, P. Block 601 for Over Serviceable Limits Extension
4 Nicks and tears on the trailing edge of the OGV	One permitted in a vane if it is less than 1.0 in. (25 mm) along the edge and not more than 0.50 in. (12.7 mm) in depth	Replace vane (Ref. 72-23-00, P. Block 801). See 72-00-00, P. Block 601 for Over Serviceable Limits Extension
5 Nicks and tears on the leading edge of the OGV	Defects permitted if less than 2.0 in. (51 mm) in length. The total of the damage must be less than 6.0 in. (152 mm) in length and not more than 0.50 in. (12.7 mm) in depth. Each defect must be separated by 0.50 in. (12.7 mm)	Remove high material until smooth. Remove all sharp edges and loose material
6 Delamination on the trailing/ leading edge	Permitted, if the sum total of all lengths of defects are less than 2.5 in. (64 mm) and the depth is not more than 0.25 in. (6.4 mm) for each defect	Replace vane (Ref. 72-23-00, P. Block 801). See 72-00-00, P. Block 601 for Over Serviceable Limits Extension
(b)OGV's without or missing metal leading edges (and with speed tape applied to leading edges) for :		
1 Nicks, scratches, and gouges on the concave/ convex airfoil surface	Permitted, if the defects are less than 0.04 in. (1.0 mm) in depth. No sharp grooves are permitted.	Replace vane (Ref. 72-23-00, P. Block 801). See 72-00-00, P. Block 601 for Over Serviceable Limits Extension
2 Dents (all	Permitted with a smooth	Replace vane

INSPECTION/CHECK	MAX. SERVICEABLE LIMITS	REMARKS
areas of the OGV)	contour, if not more than 0.07 in. (1.8 mm) in depth	(Ref. 72-23-00, P. Block 801). See 72-00-00, P. Block 601 for Over Serviceable Limits Extension
3 Polyurethane coating that is loose or gone	Permitted ; remove loose polyurethane coating	
4 Nicks and tears on the trailing edge of the OGV	One permitted in a vane if it is less than 1.0 in. (25 mm) along the edge and not more than 0.50 in. (12.7 mm) in depth	Replace vane (Ref. 72-23-00, P. Block 801). See 72-00-00, P. Block 601 for Over Serviceable Limits Extension
5 Nicks and tears on the leading edge of the OGV	Defects are permitted if the depth is less than 0.50 in. (12.7 mm).	Remove high material until smooth. Remove all sharp edges and loose material
6 Delamination on the trailing/ leading edge	Permitted, if the depth is not more than 0.25 in. (6.4 mm) for each defect	Replace vane (Ref. 72-23-00, P. Block 801). See 72-00-00, P. Block 601 for Over Serviceable Limits Extension
(c)OGV's with metal leading edges for :		
1 Nicks, scratches, and gouges on the concave/ convex airfoil	Permitted, if the defects are less than 0.04 in. (1.0 mm) in depth. No sharp grooves are permitted.	Replace vane (Ref. 72-23-00, P. Block 801). See 72-00-00, P. Block 601 for Over Serviceable Limits Extension
2 Dents (all areas of the OGV)	Permitted with a smooth contour, if not more than 0.07 in. (1.8 mm) in depth	Replace vane (Ref. 72-23-00, P. Block 801). See 72-00-00, P. Block 601 for

INSPECTION/CHECK	MAX. SERVICEABLE LIMITS	REMARKS
		Over Serviceable Limits Extension
3 Nicks and tears on the trailing edge of the OGV	One permitted in a vane if it is less than 1.0 in. (25 mm) along the edge and not more than 0.50 in. (12.7 mm) in depth	Replace vane (Ref. 72-23-00, P. Block 801). See 72-00-00, P. Block 601 for Over Serviceable Limits Extension
4 Nicks and tears on the leading edge of the OGV	Any amount 0.060 in. (1.52 mm) deep are permitted.	If greater than 0.060 in. (1.52 mm) deep, blend smooth to maximum depth of 0.50 in. (12.7 mm)
5 Unbonded/missing metal from the leading edge	Permitted (all amounts). Remove all loose pieces. Make the remaining metal edges smooth with the surface of the OGV.	Remove all loose pieces. The metal that remains on edges must be smooth with the OGV surface. For missing pieces of metal from the leading edge, refer to limits for OGV's with and without speed tape
6 Delamination on the trailing edge	Permitted, if the depth is not more than 0.25 in. (6.4 mm) for each defect and if the total sum of the lengths of all defects is less than 2.50 in. (63.5 mm).	Replace vane (Ref. 72-23-00, P. Block 801). See 72-00-00, P. Block 601 for Over Serviceable Limits Extension
(12)Aft Outer Liner Segments NOTE : Whenever serviceable limits for the following items are exceeded, refer to the Over-Serviceable-Limit-Extension, if necessary.		
(a)All areas (Except wire mesh) for :		
1 Cracks	Not serviceable	Repair liner (Ref. 72-23-00,

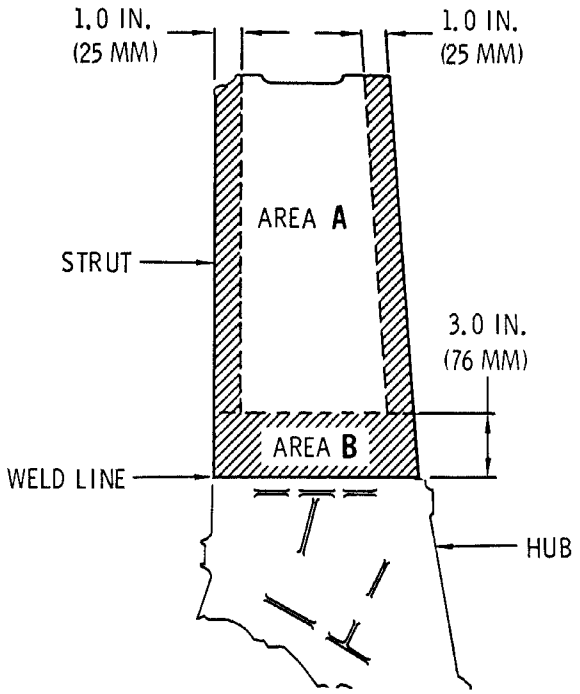
INSPECTION/CHECK	MAX. SERVICEABLE LIMITS	REMARKS
		P. Block 801).
2 Nicks and scratches	Any number provided glass laminate does not exhibit broken fibers	
3 Delamination	Not serviceable	Repair liner (Ref. 72-23-00, P. Block 801)
4 Pieces that are gone	Not serviceable	Repair liner (Ref. 72-23-00, P. Block 801)
5 Tears and cuts in surface coating	3 per panel in a fwd to aft direction with a maximum cumulative length of 3 in. (76.2 mm). Circumferential defects not serviceable	Repair liner (Ref. 72-23-00, P. Block 801)
6 Tears and cuts along leading edge surface coating	Not serviceable	Repair liner (Ref. 72-23-00, P. Block 801).
7 Dents in liner facesheet	Permitted if there are no tears or unbonded areas in the liner	
(b)Wire mesh for :		
1 Tears, cut and delamination	Not serviceable	Remove loose material. Solvent clean repair area and apply adhesive (C01-106). Press edges of loose wire mesh into adhesive. Cure for 1 hour at 175°-200°F (79-93°C).
2 Nicks and scratches	Any number if mesh does not exhibit broken strands	
3 Pieces that are gone	Any amount	Remove loose material. Solvent clean repair area and apply adhe-

INSPECTION/CHECK	MAX. SERVICEABLE LIMITS	REMARKS
		sive (C01-106). Press edges of loose wire mesh into adhesive. Cure for 1 hour at 175°-200°F (79-93°C).
(13)Visually inspect the aft inner liner aft brackets for :		
(a)Cracks	Not serviceable	See 72-00-00, P. Block 601 for Over Serviceable Limit Extension
(14)Visually inspect the aft inner liner forward brackets for :		
(a)Cracks	Not serviceable	See 72-00-00, P. Block 601 for Over Serviceable Limit Extension
NOTE : (a)Inspect forward end of aft inner liner. If there is lifting and/or misalignment between panels, remove the liner and inspect the forward side of the bracket. If cracks are found, replace the bracket (Ref. 72-23-00, P. Block 801). (b)Visually inspect the bracket for cracks in the aft side. If cracks are found, replace the bracket (Ref. 72-23-00, P. Block 801).		
(15)Molded Nylon Flowpath Fairings for : (See NOTE 1)		
(a)Cracks in the side lips	Any number not extending into main body more than 0.06 in. (1.5 mm)	Replace Flowpath Fairing (Ref. 72-23-00, P. Block 801).
(b)Loose inserts	Any amount	
(c)Sections that are gone	Any amount confined between aft edge and 1.0 in. (25 mm) forward of aft edge	Replace Flowpath Fairing (Ref. 72-23-00, P. Block 801).
(d)Fillet lip that are gone	Any amount, if it does not extend into main body	Replace Flowpath Fairing (Ref. 72-23-00, P. Block 801).
(e)Cracks extending	Two cracks per fairing	Replace Flowpath

INSPECTION/CHECK	MAX. SERVICEABLE LIMITS	REMARKS
from insert to forward lip		Fairing (Ref. 72-23-00, P. Block 801).
(16)Aft Fan Case Fan Reverser Seals for :		
(a)Pieces of bulb seal that are gone	Not serviceable	Repair (Ref. 72-23-00, P. Block 801)
(b)Tears, cuts, and punctures in bulb seal	Any number provided positive engagement with retainer is maintained	Repair
(c)Tears, cuts, punctures and missing pieces in expandable seal	Permitted if the bulb seal is serviceable	Repair bulb seal (Ref. 72-23-00, P. Block 801)

NOTE 1 : (Ref. Fig. 602)

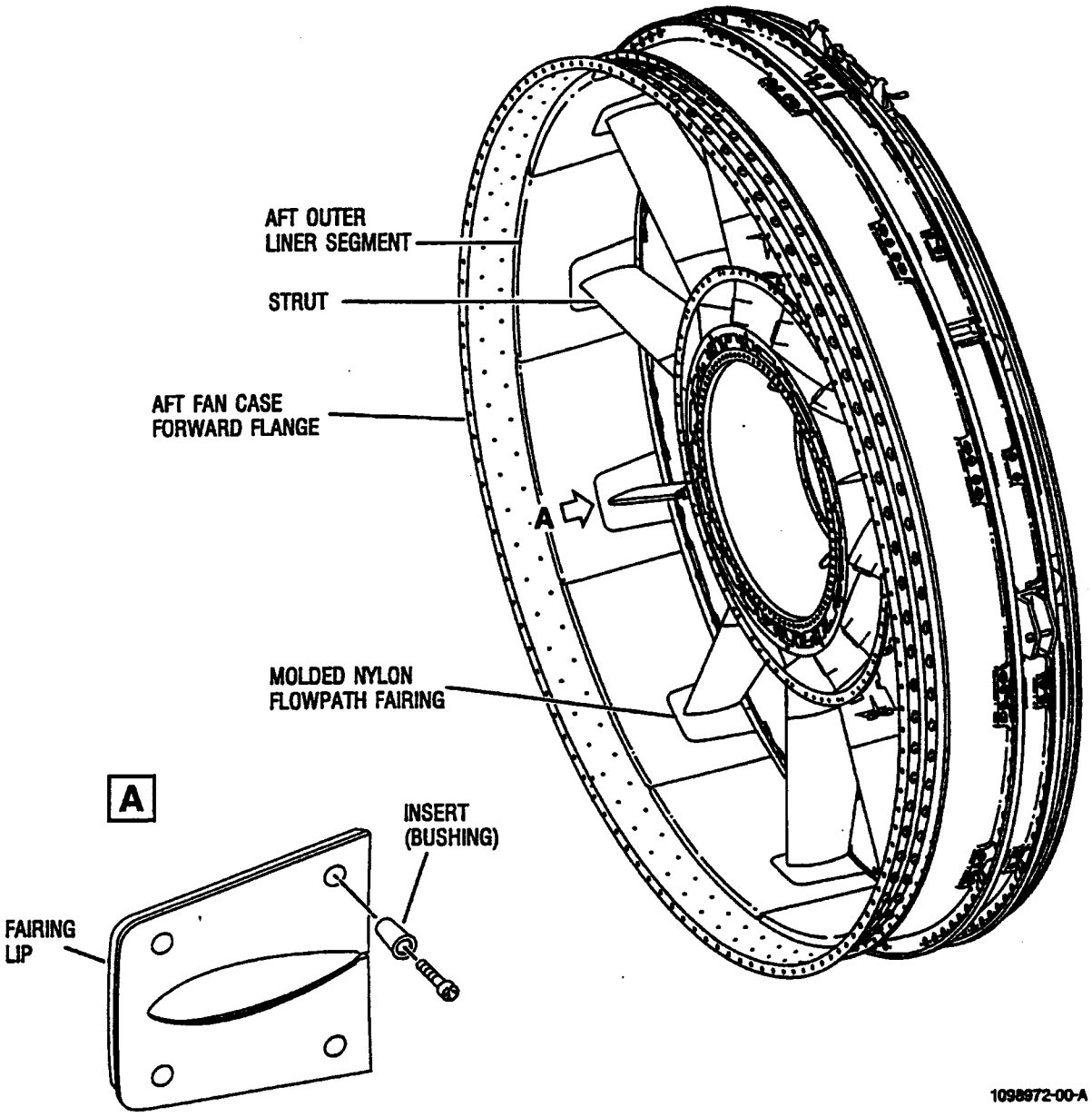
INSPECTION/CHECK	MAX. SERVICEABLE LIMITS	REMARKS
Post GE SB 72-719 (New Lightweight Flowpath Extensions)		
(17)Flowpath Extensions for :		
(a)Missing material	None permitted	See 72-00-00, P. Block 601 for Over-serviceable Limit Extension
End Post GE SB 72-719		



CF8-C3337-00-C

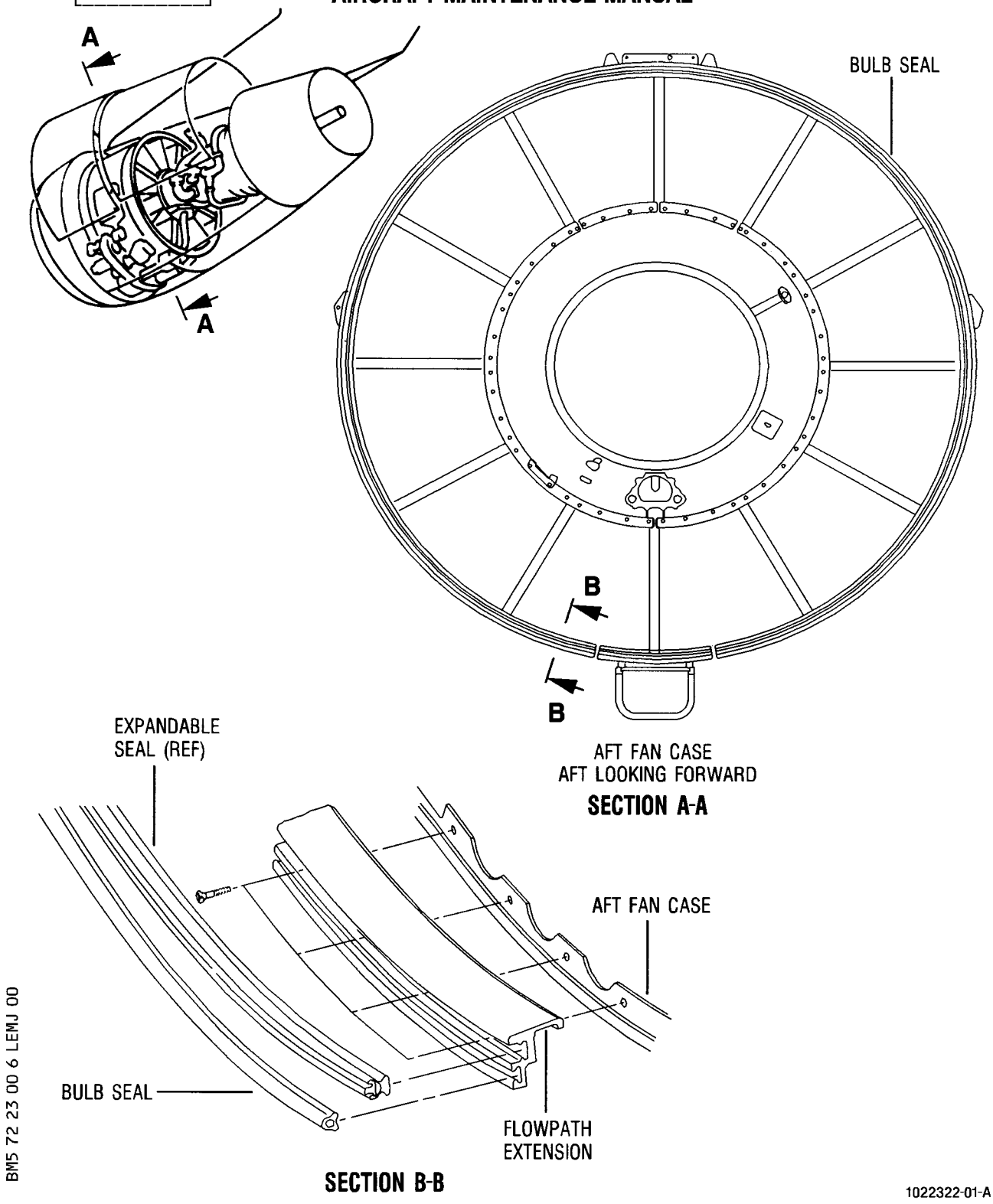
BM5 72 23 00 6 LCMO-15-08
DM5

Fan Frame Strut
Figure 601



BM5 72 23 00 6 LEMA 00

Flowpath Fairing Replacement (Sheet 1/2)
Figure 602



Flowpath Fairing Replacement (Sheet 2/2)
Figure 602

FAN FRAME AND CASE ASSEMBLY - APPROVED REPAIRS

1. Equipment and Materials

ITEM	DESIGNATION
A. Material No.C01-006	Adhesives, Plastics, Sealants (Ref. 70-00-00)
B. Material No.C01-007	Adhesives, Plastics, Sealants (Ref. 70-00-00)
C. Material No.C01-011	Adhesives, Plastics, Sealants (Ref. 70-00-00)
D. Material No.C01-056	Adhesives, Plastics, Sealants (Ref. 70-00-00)
E. Material No.C02-001	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
F. Material No.C02-004	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
G. Material No.C02-006	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
H. Material No.C02-008	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
I. Material No.C02-020	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
J. Material No.C02-058	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
K. Material No.C04-001	Cleaning Compounds and Solvents (Ref. 70-00-00)
L. Material No.C04-005	Cleaning Compounds and Solvents (Ref. 70-00-00)
M. Material No.C10-013	Miscellaneous (Ref. 70-00-00)
N. Material No.C10-116	Miscellaneous (Ref. 70-00-00)
O. Material No. 08-019	Bonding and Adhesive Compounds (Ref. 20-31-00)
P. MIL-C-85403 (TYPE II)	Cloth (Lint Free)
Q. 2C6372	Heating Element
Referenced Procedure - 72-21-00, P. Block 801	Fan Rotor Assembly

2. Fan Frame and Case Assembly

Instructions provided in these procedures are for repair of damaged parts of the fan frame and case assembly on an installed engine.

A. Surface Repairs on Aft Fan Case Aft and Fan Stator Aft Inner Outer Liner Segments

(1)Make surface repairs as follows :

CAUTION : DO NOT ATTEMPT TO REMOVE PANEL FROM AFT CASE. ADDITIONAL DAMAGE MAY RESULT DUE TO PANEL BEING BONDED TO CASE.

CAUTION : DO NOT CUT ALL THE WAY THROUGH THE PANEL TO THE BACK FACE ; IT IS NOT NECESSARY AND MAY DAMAGE THE BACK FACE.

(2)Cut away damaged area using a hole saw 1/8 in. to 1/4 in. (3.2 - 6.4 mm)

larger diameter than damaged area but not over 2 in. (50.8 mm) diameter. Cut slightly below the damaged surface ensuring that hole saw pilot does not penetrate the liner back sheet.

(3) Remove the damaged material inside the cut circle down to the bottom of the cut hole.

WARNING : CLEANING SOLVENTS ARE HIGHLY FLAMMABLE, VOLATILE, AND TOXIC. USE WITH ADEQUATE VENTILATION. AVOID PROLONGED BREATHING OF VAPORS AND REPEATED OR PROLONGED CONTACT WITH THE SKIN.

(4) Remove all loose particles, chips, and dust. Blow gently with clean, filtered, compressed air. Clean repair area with solvent (C04-005) to remove all dirt, oil, grease, and moisture.

(5) Bend down loose wire ends on the face sheet to trap ends in filling compound and eliminate a safety hazard.

(6) Prepare and apply microballoon material. Force material into cells by working back and forth in all directions to ensure the fill to the bottom.

NOTE : Mask adjacent areas prior to application of microballoon.

(7) Fill the repair cavity approximately 1/8 in. (3.2 mm) above the surrounding face sheet surface.

NOTE : Mix only as much material that can be conveniently applied within the set up time of the filler.

(8) Cure microballon mixture at room temperature for one hour followed by one hour at 135° - 150°F (57° - 66°C).

(9) When partially cured, use a razor blade or sharp knife to trim the repair material to about 1/16 in. (1.5 mm) above flush with the face sheet.

(10) When fully cured, file or sand the repair flush with the surrounding surface of the face sheet. Remove masking tape.

B. Repair Fan Reverser Support Wear Coating as Follows :

(1) Clean the Cu-Ni-In surface with solvent (C04-001) and a bristle brush to remove all oils.

(2) Dry the surface with a heat gun or lamp.

(3) Apply Material No.C02-001 or Material No.C02-058 to the wear-coated surfaces.

C. Replacement of Fan Stator Aft Inner Flowpath Liner Segments.

(1) Using a razor blade or sharp knife, carefully cut through the RTV at the axial and circumferential edges of the liner segment(s) to be removed.

(2) Remove the liner segment(s) by loosening each of the 4 self-retaining screws which secure the liner segment to stator case and strut brackets.

(3) Clean all residual RTV from remaining adjacent liner segments, fan frame struts and OGV fairing.

(4) Install replacement liner segment(s) onto the fan stator case and strut brackets. TORQUE the 4 self-retaining screws to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN).

(5) Using a clean cloth moistened with solvent (C04-001), clean the axial and circumferential gaps between OGV fairing, fan frame struts and adjacent liner segments.

(6) Fill the gaps in the areas cleaned in the preceding step with black silicone rubber (C01-006). Contour the compound with adjacent surfaces.

D. Replacement of Fan Stator Outlet Guide Vanes (OGV) (Ref. Fig. 801)
(1)Replacement of a single OGV from OGV sector
(a)Remove OGV as follows :
1 Cut the defective OGV (Ref. Fig. 801) at mid chord with a hacksaw or equivalent.
Pre SB GE 72-258 and/or 72-262
2 Remove the four vane platform mount bolts.
End Pre SB GE 72-258 and/or 72-262
Post SB GE 72-258 and/or 72-262
2 Remove the four vane platform mount bolts, nuts, and washers.
End Post SB GE 72-258 and/or 72-262
3 Remove RTV sealant at both forward and aft edges of vane platform and remove vane.
(b)Rework replacement vane as follows :
1 Measure 0.250 in. (6.35 mm) down from leading edge tip and 3.0 in. (76.2 mm) back diagonally to vane tip end of replacement vane (Ref. Fig. 802) (Sheet 1 of 2). Scribe a line for material removal.
2 Make a mark at the point 0.200 in. (5.08 mm) from the leading edge of the platform lip.
3 Make a mark across the entire width of the platform lip a distance of 0.200 in. (5.08 mm).
4 Write AREA REMOVED in the area between the line and the OGV tip to identify what you will remove.
5 Using a hack saw or equivalent, cut off material labeled "area removed".
NOTE : If the airfoil and platform are at the minimum dimensions specified by (Ref. Fig. 802) (Sheet 2 of 2), then the OGV can be installed without the removal of material.
6 Stone or lightly dress up rough edges as required.
7 After the tip of the leading edge is removed, inspect the airfoil to make sure the metal on the leading edge is not delaminated. If delamination has occurred, discard the OGV and replace with a new OGV.
(c)Install replacement OGV into sector as follows :
1 Lubricate vane tip, bottom side of vane platform and sleeve of inner OGV support with lubricant (CO2-008) or equivalent.
2 Lightly hit the support panel until it is inserted as far as it will go.
3 Insert 1/3 of the vane trailing edge tip chord into inner OGV support sleeve, enabling the front edge of the vane platform to protrude approximately 1.0 in. (25 mm) aft of the aft outer fan frame acoustic liner leading edge.
4 Using hand held pressure only, pull vane tip aft into the inner OGV support sleeve while twisting the vane platform to align with the adjacent vanes.
5 With vane end inserted into inner OGV support sleeve, the vane platform can be pushed forward into place.
NOTE : An interference of the vane tip of the LPC booster splitline may occur at vanes located at 3 and 9 o'clock position. Use a mallet and plastic drift to lightly tap vane platform into

position.

6 Prior to seating vane, ensure leading edge of vane platform clears the aft edge of the mid outer acoustic liner.

Pre SB GE 72-258 and/or 72-262

7 Install the four vane platform mount bolts.

End Pre SB GE 72-258 and/or 72-262

Post SB GE 72-258 and/or 72-262

7 Install the four vane platform mount bolts, washers, and nuts.

End Post SB GE 72-258 and/or 262

8 TORQUE the bolts to between 200 and 250 lbf.in. (2.26 and 2.82 m.daN).

9 Seal the forward and aft edges of vane platform with black silicone rubber (C01-006).

(2)Replacement of OGV sectors.

(a)Remove the fan spinner and stage one fan rotor blades (Ref. 72-21-00, P. Block 801).

NOTE : Remove only the number of blades required to gain access to the working area.

(b)Using a razor blade or sharp knife. Cut the RTV filling the gaps between the fan stator fairing, fan case outer liner segments and flow path inner liner segments.

(c)At each OGV (Ref. Fig. 801) sector remove 2 screws which secure the inner OGV support and fan stator fairing to the booster stator casing.

(d)At each OGV sector remove 2 screws which secure the sector to brackets on the stages 2-4 boaster stator case.

(e)Remove 20 bolts securing each OGV sector to the aft fan case and remove the OGV sector. Make note of sector location within the aft fan case if more than one OGV sector is to be removed.

NOTE : A single vane may be replaced within the vane sector. Care must be taken to replace the vane with a vane of the same part number as there may be more than one vane part number within a vane sector

(f)Clean all residual RTV from the items adjacent to the removed OGV sector.

(g)Position the replacement OGV sector against the aft fan case and onto the booster stator casing.

(h)Coat 20 bolts per OGV sector with lubricant (C02-006 or C02-020) and install bolts through OGV platform and into the aft fan case.

(i)Secure each sector to the booster stator casing with 4 screws lubricated with lubricant (C02-004 or C02-006).

(j)TORQUE the OGV to fan case attachment bolts to 200 - 250 lbf.in. (2.26 - 2.83 m.daN).

(k)TORQUE the OGV sector to booster stator casing and brackets to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN).

(l)Fill the upper and lower circumferential gaps between liner segments and fairings with silicone rubber compound (C01-006). Contour to adjacent surfaces.

(m)Install stage one fan rotor blades and fan spinner (Ref. 72-21-00, P. Block 801).

E. Replacement of Variable Bypass Valve

(1)Remove the aft inner flow path liner segment(s) per paragraph 3.C.

CAUTION : DO NOT DISTURB ADJUSTMENT ON THE ROD END BEARING.

(2)Remove nut, washers and bolt that connect rod end bearing to bypass valve clevis.

(3)Remove nut, washer and bolt securing bypass valve assembly (valve and hinge) to the fan frame.

(4)Remove the hinge from the valve by removing nuts, washers, sleeves and bolts.

(5)Assemble the replacement bypass valve to hinge as follows :

(a)Coat the threads of the valve to hinge attachment bolts with Material No.C02-006 or C02-020.

(b)Install a sleeve onto each bolt with the flange of sleeve against the bolt head.

(c)Position the valve onto hinge and secure with 2 bolts, 2 sleeves, 2 washers and 2 nuts for each valve. Bolt heads should be outward.

(d)TORQUE nuts to between 33 and 37 lbf.in. (0.37 and 0.42 m.daN).

(6)Install the bypass valve assembly onto fan frame as follows :

(a)Assemble the valve assembly on the fan frame using 2 bolts (heads aft), washers and nuts.

(b)TORQUE nuts to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN).

(c)Spray coat the seal around the valve and the fan frame mating surface with Material No.C10-013.

CAUTION : DO NOT DISTURB ADJUSTMENT ON THE ROD END BEARING.

(7)Connect the rod end bearing to bypass valve clevis with bolt, washers (one under bolt and one under nut) and nut. TORQUE to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN).

(8)Reinstall the aft inner flow path liner segment(s) per paragraph 3.C.

F. Repair of the Thrust Reverser Bulb Seal

WARNING : CLEANING SOLVENTS ARE DANGEROUS. MAKE SURE YOU HAVE A GOOD FLOW OF AIR. DO NOT LET CLEANING SOLVENTS TOUCH YOUR EYES OR STAY ON YOUR SKIN REGULARLY AND/OR CONTINUOUSLY.

(1)Clean in and around the damaged area with Material No.C04-001 or C04-005.

(2)Fill the damaged area with Material No.C01-007 or C01-056.

G. Repair of Aft Fan Casing Ribs

(1)Do a fluorescent penetrant inspection (FPI) on the crack to determine the ends of the crack (Ref. 70-00-00, P. Block 201).

(2)Mark the ends of the crack.

(3)Stop drill the ends of the crack with a 0.093 in. (2.36 mm) or 0.098 in. (2.49 mm) drill bit.

(4)Remove the high metal.

(5)Do a Fluorescent Penetrant Inspection (FPI) on the crack to determine that the stop drill hole is in correct location to end the crack.

(6)Touch-up the surface of the case with alodine.

H. Repair of Fan Stator Outlet Guide Vanes

Pre SB GE 72-292 *** (ENGINES WITHOUT METAL LEADING EDGE FAN OUTLET GUIDE VANES)

WARNING : SOME OF THE STEPS OF THE FOLLOWING PROCEDURES REQUIRE CUTTING, SANDING AND/OR FILING. THE USE OF VACUUM CLEANER (WITH THE INTAKE ADJACENT TO THE REPAIR AREA TO DRAW OFF SANDING/FILING DUST) AND

APPROVED DUST MASK (TO PREVENT INHALATION OF SANDING/FILING DUST) SHOULD BE CONSIDERED MANDATORY.

(1)Tap around the damaged surface of the vane to detect the boundary of the delaminated material. If undelaminated material is tapped, the impact will have the sound of a solid "click". If the surface ply is delaminated, a slightly hollow sound will result. Use a felt tip pen to mark the boundary of delaminated material.

(2)Remove all damaged and loose material from vane. Remove broken and/or cracked pieces along the boundary of the delaminated area (marked in paragraph (1), using pliers or utility knife.

NOTE : Use CAUTION to avoid extending the damage area.

(3)Inspect damaged area of vane, once the delaminated material is removed. Repair area is limited to 1.0 in. (25 mm) along edge and 0.5 in. (13 mm) deep.OGV leading edge may have maximum of 5 areas to be repaired. Repair may not overlap.

NOTE : A temporary repair may be performed for leading edge damage not exceeding 1.5 in. (38.1 mm) and 0.5 in. (13 mm) deep, by smoothing the leading edge and application of aluminium speed tape. This temporary repair may be used until permanent repair or replacement is possible.

(4)Prepare vane for adhesive application as follows :

WARNING : CLEANING SOLVENTS ARE DANGEROUS. MAKE SURE YOU HAVE A GOOD FLOW OF AIR. DO NOT LET CLEANING SOLVENTS TOUCH YOUR EYES OR STAY ON YOUR SKIN REGULARLY AND/OR CONTINUOUSLY.

(a)Clean vane surface with white cloths moistened with solvent (C04-001 or C04-005). Allow solvent to dry for a minimum of 10 minutes.

(b)Apply wide masking tape to the cleaned vane surface at least 2.0 in. (50.8 mm) beyond damaged area. Apply smoothly and in one-piece starting on the convex face, wrapping around the edge and extending onto the concave face (Ref. Fig. 803). Trim masking away from damaged area, using a utility knife.

(c)File damaged area smooth and remove exposed shards of vane filing through masking tape, using a file of the appropriate size and profile. Make final strokes at an approximately 60 degree angle to vane surface from both faces. The final repair contact surface should appear as shown in (Ref. Fig. 804).

(d)Clean repair area and vane surface with white cloths moistened with solvent (C04-001 or C04-005) and clean rags to remove filing dust or any other foreign material. Allow solvent to dry for a minimum of 10 minutes.

(e)Apply a layer of wide masking tape smoothly to the concave surface of the vane and extend around the edge. Lay two more layers of tape on top the first layer. This forms a pocket for the retention of patch material.

(5)Prepare adhesive as follows :

WARNING : DO NOT LET THE EPOXY RESIN SOLUTION TOUCH YOU. THIS SOLUTION IS VERY DANGEROUS TO YOUR EYES AND SKIN. MAKE SURE YOU HAVE A GOOD FLOW OF AIR. DO NOT BREATHE THE FUMES RELEASED FROM THE EPOXY RESIN SOLUTION. THE FUMES ARE DANGEROUS TO YOUR LUNGS.

(a)Prepare adhesive (C01-011) in a clean metal or uncoated metal

container. To 100 parts by weight resin (Part A) add 33 parts by weight catalyst (Part B) and mix thoroughly. No streaks of either resin or catalyst should be visible after mixing.

(b)Add 22% by weight of milled graphite fibers (C10-116) and throughly mix into adhesive.

(c)Degas the mixture of resin, hardener and milled fibers by tapping firmly against a horizontal surface for approximately 10 minutes.

(6)Apply patching material as follows :

(a)Paddle the patch material into the tape pocket, being careful not to trap air in the patch. Fill pocket flush to slightly over flush from the convex face of the vane.

(b)Pull the three masking tape layers (one layer at a time) over the patch to form patch and force out air.

(c)Allow to cure 60° -80°F (15.5° -26.6°C) for 24 hours. A faster curing cycle can be achieved by heating the repair area to 135° -145°F (57.2° -62.7°C) for 2 hours.

(d)Remove the overlay layers of masking tape from the cured patch. Then remove the single layer of protective tape from the vane surface.

(e)Hand sand or blend repair area flush with vane contour.

(f)Clean sanding residue from vane with a clean rag and water. Wipe away excess water and allow to air dry for at least two hours.

End Pre SB GE 72-292

SB GE 72-292 * (ENGINE MODIFIED WITH IMPROVED FAN OUTLET GUIDE VANES)**

(5)Repair/Protect Metal Leading Edge of Fan Stator Outlet Guide Vanes as follows :

(a)Tap around the damaged surface of the vane to detect the boundary of the delaminated material. If undelaminated material is tapped, the impact will have the sound of a solid "click". If the surface ply is delaminated, a slightly hollow sound will result. Use a felt tip pen to mark the boundary of delaminated material.

(b)Prepare vane for aluminium speed tape application as follows :

WARNING : CLEANING SOLVENTS ARE DANGEROUS. MAKE SURE YOU HAVE A GOOD FLOW OF AIR. DO NOT LET CLEANING SOLVENTS TOUCH YOUR EYES OR STAY ON YOUR SKIN REGULARLY AND/OR CONTINUOUSLY.

1 Clean vane surface with white cloths moistened with solvent (C04-001 or C04-005). Allow solvent to dry for a minimum of 10 minutes.

2 After the bad material is removed, examine the damaged area of the vane. The repair area is confined to 1.0 in. (25 mm) along the edge and 0.5 in. (13 mm) in depth. The OGV leading edge can have a maximum of five areas to be repaired.

The repairs cannot overlap.

NOTE : A temporary repair can be done for leading edge damage that is no more than 1.5 in. (38 mm) in length and 0.5 in. (13 mm) in depth. To repair the leading edge, smooth it out and apply aluminum speed tape (08-019). This temporary repair can be used until a permanent repair or replacement is possible.

NOTE : Ensure that the aluminium speed tape extends beyond the metal leading edge, and is secure to the composite airfoil.

End SB GE 72-292

I. Replacement of the Fan Frame Strut/Aft Fan Case Molded Nylon Flowpath Fairing(s)

(1)Use a razor blade or sharp knife to cut through the RTV that fills the gaps between the flowpath fairing and the fan strut. Also, cut the RTV in the gaps between the flowpath fairing and aft fan case.

(2)Loosen the four self-retaining screws that attach the flowpath fairing to the aft fan case around the fan frame strut.

(3)Mark the location on a tag and attach the tag to one of the self-retaining screws.

(4)Remove the flowpath fairing(s) from around the fan frame strut(s).

NOTE : A single flowpath fairing can be replaced in the fan case. Be sure to replace the fairing with a fairing of the same part number.

WARNING : CLEANING SOLVENTS ARE DANGEROUS. MAKE SURE YOU HAVE A GOOD FLOW OF AIR. DO NOT LET CLEANING SOLVENTS TOUCH YOUR EYES OR STAY ON YOUR SKIN REGULARLY AND/OR CONTINUOUSLY.

(5)Clean all remaining RTV from the items that are adjacent to the removed fairing(s). Use a clean cloth, moist with Material No.C04-001, to clean all areas.

(6)Install the flowpath fairing(s) around the fan frame strut(s) and against the inside diameter of the aft fan case (Ref. Fig. 805).

NOTE : Flowpath fairing(s) can be trimmed around the inside diameter, up to a maximum of 0.019 in. (0.48 mm). Make sure you have a minimum clearance of 0.005 in. (0.13 mm) between the flowpath fairing and the fan frame strut.

(7)Attach each flowpath fairing to the aft fan case with the four self-retaining screws.

NOTE : Replace any self-retaining screw that requires more than a 15 lbf (67 N) installation force and less than 17 lbf (76 N) removal force.

(8)TORQUE the four self-retaining screws to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN).

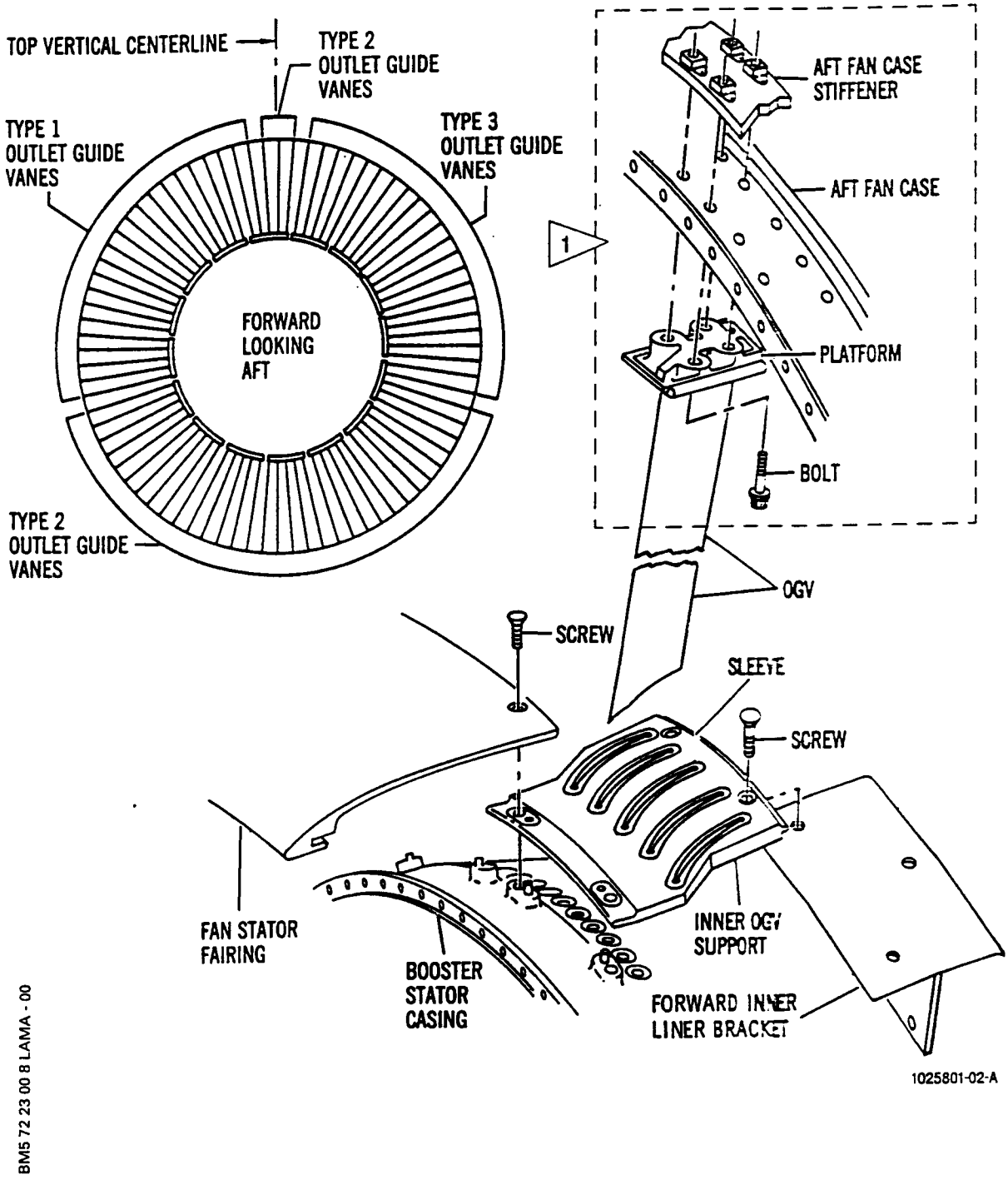
WARNING : DO NOT BREATHE THE FUMES FROM THE UNCURED SEALANT. THE FUMES ARE DANGEROUS TO YOUR NOSE AND LUNGS. MAKE SURE YOU HAVE A GOOD FLOW OF AIR. DO NOT LET THE UNCURED SEALANT TOUCH YOU.
THE UNCURED SEALANT IS DANGEROUS TO YOUR SKIN AND EYES. DO NOT USE THE UNCURED SEALANT NEAR FLAMES OR HEAT. THE FUMES RELEASED FROM THE UNCURED SEALANT ARE FLAMMABLE.

(9)Use a black silicone rubber compound RTV (C01-006), and lay a bead of compound between the fan frame strut and flowpath fairing. Also, lay a bead between the aft fan case and flowpath fairing. Smooth-out the compound with all adjacent surfaces.

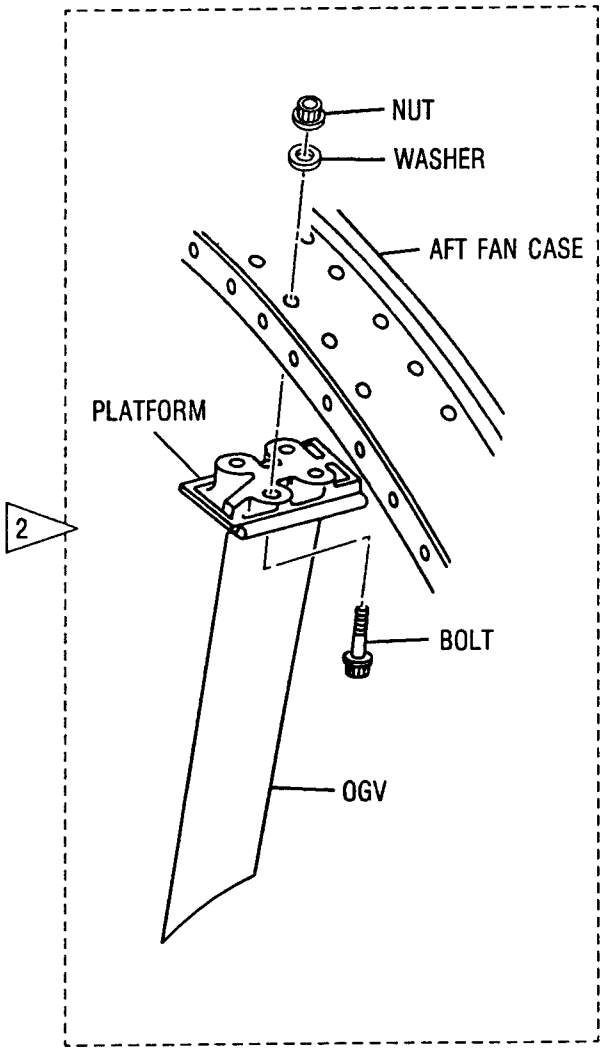
J. Thrust Reverser Bulb Seal Repair (Ref. Fig. 806)

NOTE : This procedure is used only to repair punctures to the bulb seal. All other damage requires replacement of the seal.

WARNING : DO NOT GET MEK IN YOUR MOUTH OR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM MEK. PUT ON A PROTECTIVE SPLASH GOGGLE AND GLOVES WHEN YOU USE MEK. KEEP MEK AWAY FROM SPARKS, FLAME,



Fan Stator OGV Removal/Installation (Sheet 1/2)
Figure 801



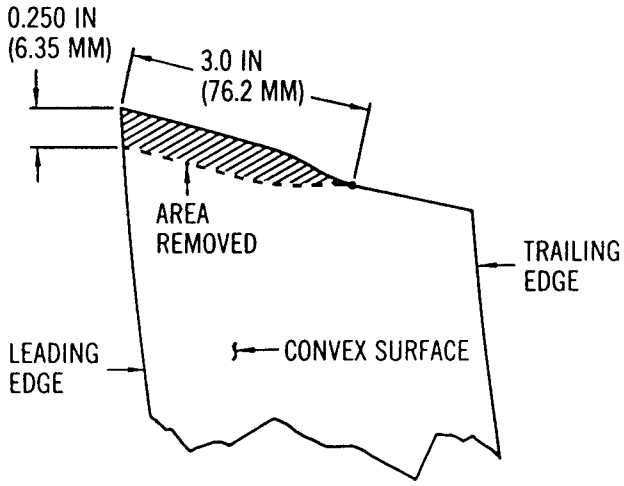
1 ENGINES WITHOUT SB GE 72-258 AND/OR 72-262

2 ENGINES WITH SB GE 72-258 (WITHOUT STIFFENERS) AND/OR 72-262 (WITHOUT ANCHOR NUTS)

1109536-00-A

BM5 72 23 00 8 LAMJ - 00

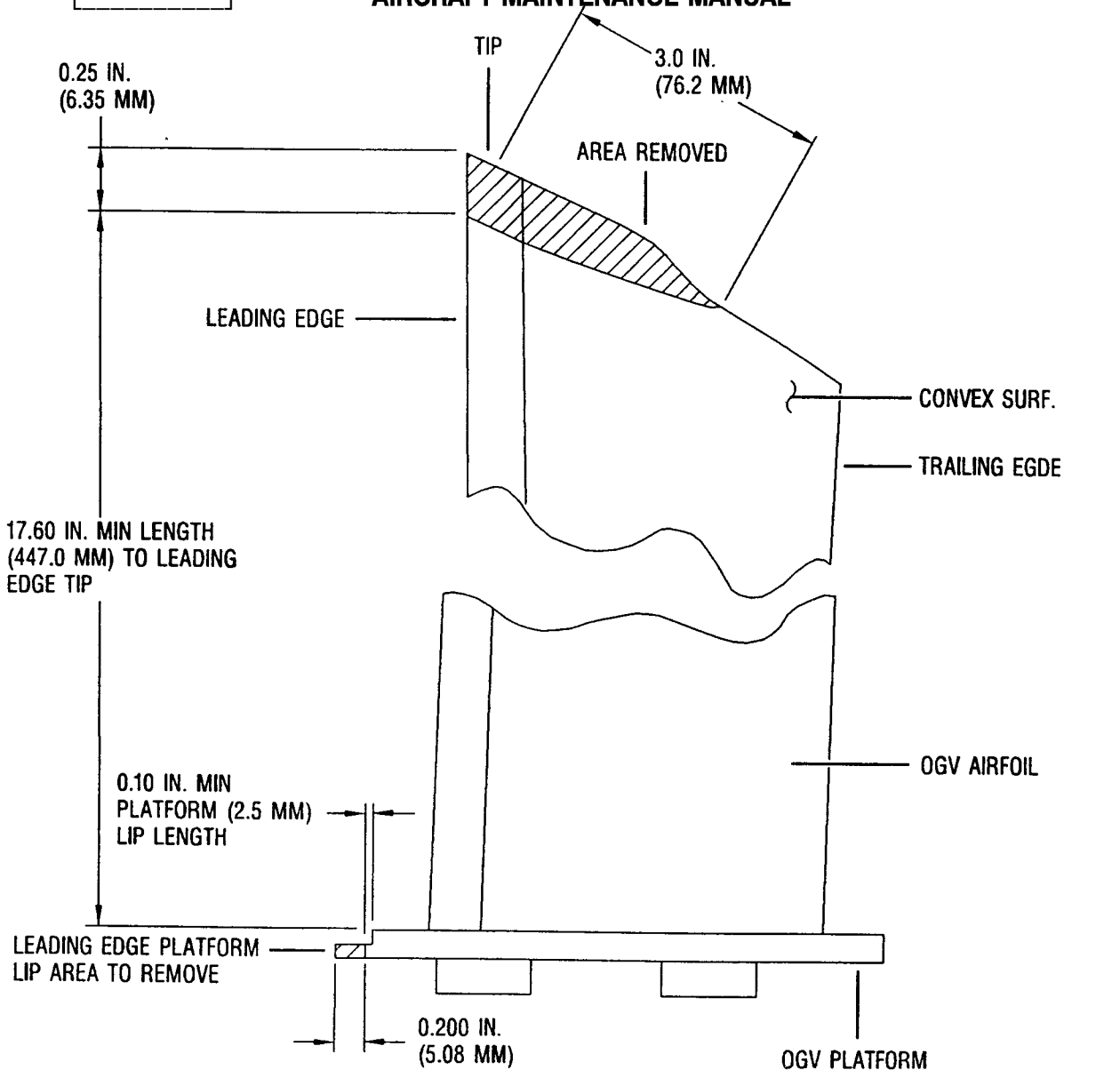
Fan Stator OGV Removal/Installation (Sheet 2/2)
Figure 801



BM5 72 23 00 8 LCMA - 00

CF8-A6123-00-C

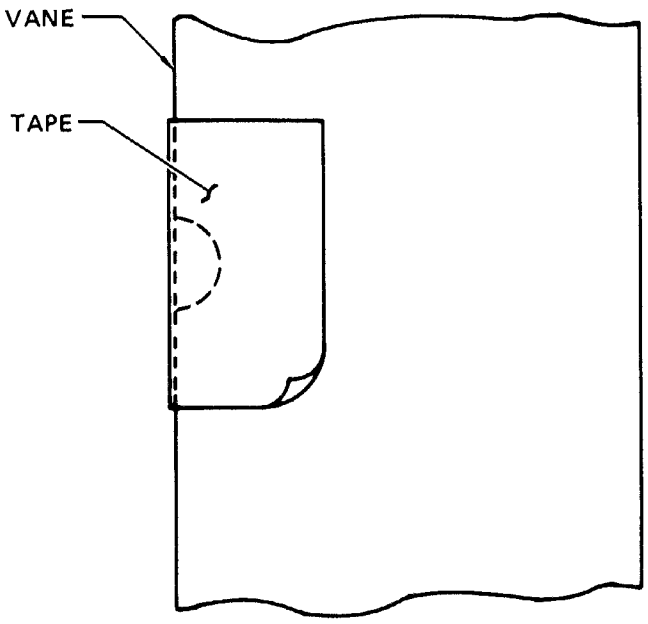
Replacement OGV Rework Area (Sheet 1 of 2)
Figure 802



1103293-01-A

BM5 72 23 00 8 LCMJ - 00

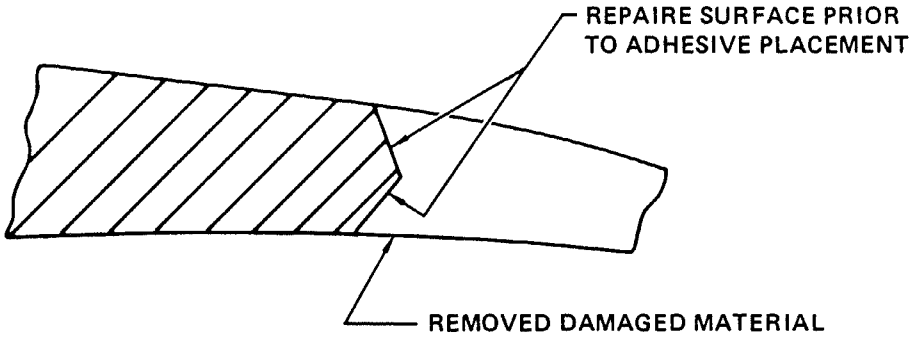
Replacement OGV Rework Area (Sheet 2 of 2)
Figure 802



BM5 72 23 00 8 LJMO - 26 - 21
DM5

CF8–D3874–00–C

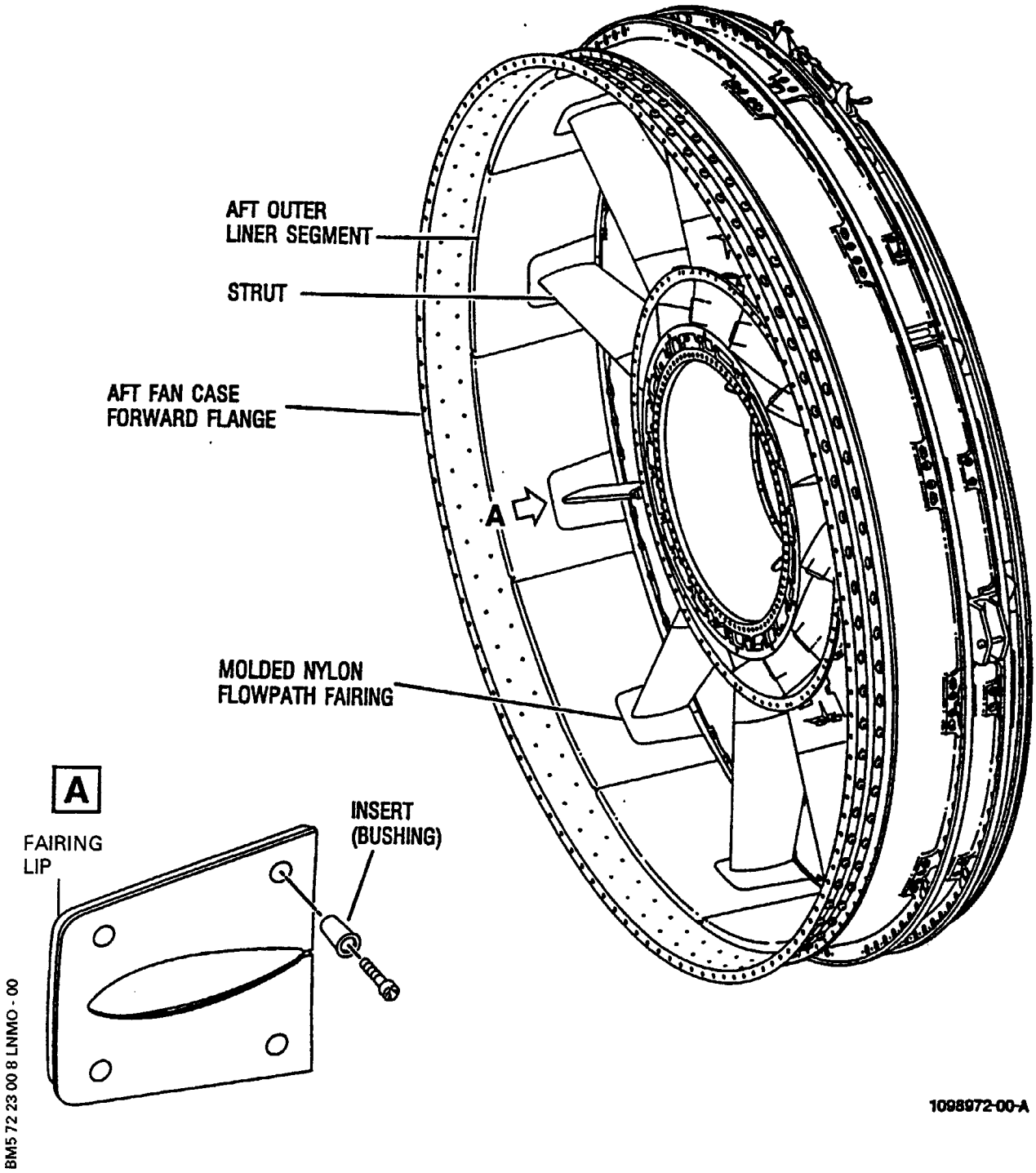
Masking Tape Application
Figure 803



BM5 72 23 00 8 LLMO - 26 - 21
DM5

CF8-D3875-00-C

Preparation of Damaged Leading Edge for Adhesive Application
Figure 804



Flowpath Fairing Replacement
Figure 805

AND HEAT. MEK IS POISONOUS AND FLAMMABLE AND CAN CAUSE INJURY OR DAMAGE.

WARNING : DO NOT LET CHLOROTHENE NU TOUCH YOU. ALSO, MAKE SURE YOU HAVE A GOOD FLOW OF CLEAN AIR. THIS MATERIAL IS VERY DANGEROUS TO YOUR SKIN, EYES, AND LUNGS.

(1)Clean in and around the damaged area of the seal. Use a lint free cloth and Material No.C04-001 or C04-005.

WARNING : DO NOT USE UNCURED RTV SEALANT NEAR FLAMES OR HEAT OR LET IT STAY ON YOUR SKIN. ALSO, MAKE SURE YOU HAVE A GOOD FLOW OF CLEAN AIR. THIS MATERIAL IS FLAMMABLE AND DANGEROUS TO YOUR SKIN, EYES, AND LUNGS.

(2)Fill the small damaged areas of the seal with Material No.C01-007 or C01-056. Give the adhesive sufficient time to cure.

(3)Replace large damaged areas with sections of new seal. Seal the edges with Material No.C01-007 or C01-056. Let the adhesive cure.

K. Aft Inner Liner Forward Bracket Replacement

(1)Remove the two screws that attach the aft end of the aft inner liner to the aft inner liner aft bracket.

(2)Remove the two screws that attach the forward end of the aft inner liner to the aft inner liner forward bracket.

(3)Remove RTV from the contour of the aft inner liner.

(4)Remove the aft inner liner.

(5)Remove the two screws that attach the aft end of the outlet guide vane fairing to the aft inner liner forward bracket.

(6)Remove the two screws that attach the aft inner liner forward bracket to the stage 2-4 fan booster stator case.

(7)Replace the old aft inner liner forward bracket with a new bracket.

(8)Replace and TORQUE the two screws that attach the aft inner liner forward bracket to the stage 2-4 fan booster stator case to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN).

(9)Replace and TORQUE the two screws that attach the aft end of the outlet guide vane fairing to the aft inner liner forward bracket to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN).

WARNING : DO NOT GET METHYL-ETHYL-KETONE (MEK) IN YOUR MOUTH OR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM MEK. PUT ON A PROTECTIVE SPLASH GOGGLE AND GLOVES WHEN YOU USE MEK. KEEP MEK AWAY FROM SPARKS, FLAME, AND HEAT. MEK IS POISONOUS AND FLAMMABLE AND CAN CAUSE INJURY OR DAMAGE.

(10)Use a clean, lint-free cloth moistened with Material No. C04-001 to clean the following areas :

(a)Circumferential gap between the aft end of the outlet guide vane fairing and the forward end of the aft inner liner.

(b)Axial gaps between the aft inner liners.

(c)Axial gaps between the aft inner liner and the fan frame struts

(11)Install the aft inner liner.

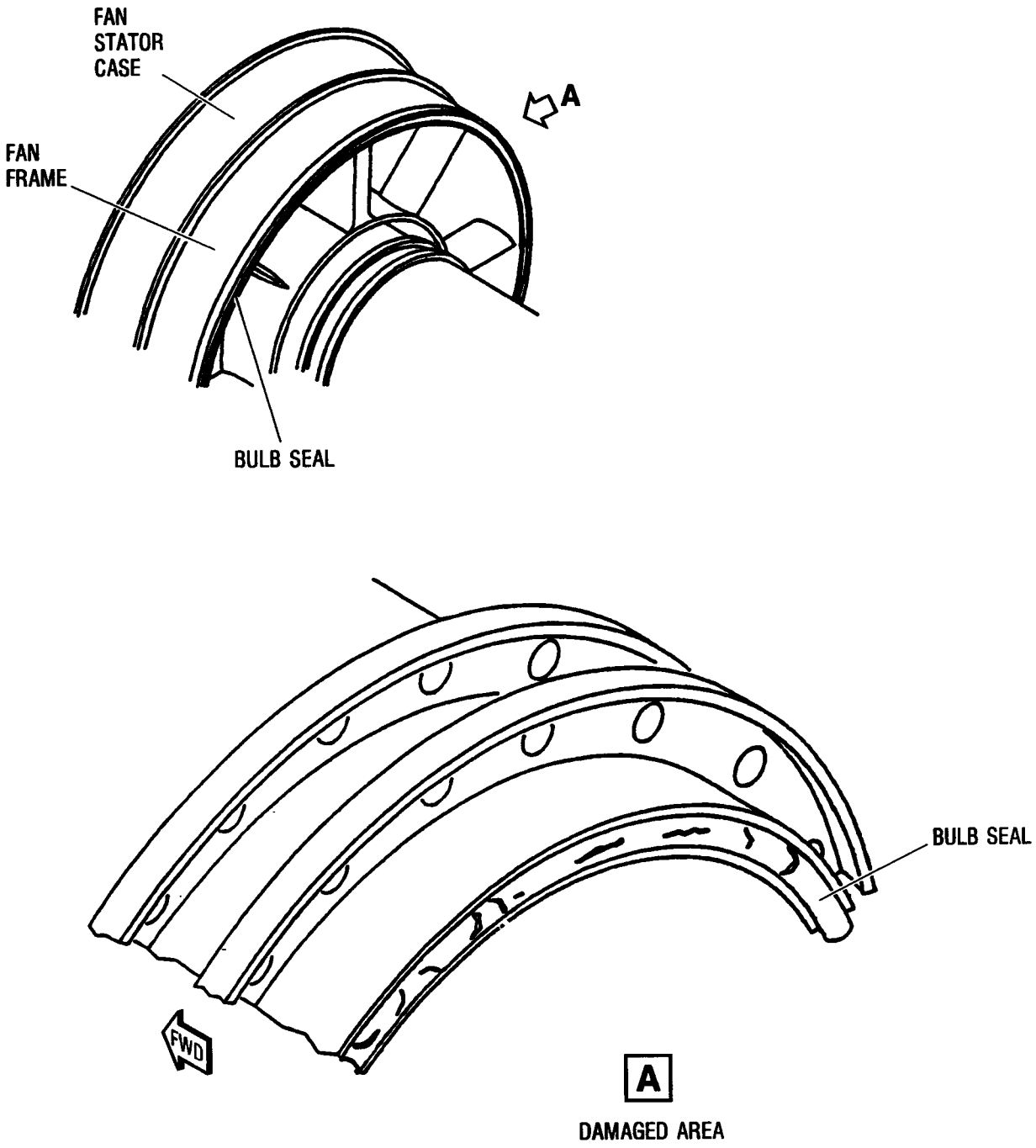
WARNING : DO NOT USE UNCURED RTV SEALANT NEAR FLAMES OR HEAT OR LET IT STAY ON YOUR SKIN. ALSO, MAKE SURE YOU HAVE A GOOD FLOW OF CLEAN AIR. THIS MATERIAL IS FLAMMABLE AND DANGEROUS TO YOUR SKIN,

EYES AND LUNGS.

(12) Fill the gaps in the areas cleaned in step (10) with Material No. C01-006. Contour the compound with the adjacent surfaces.

(13) Replace and TORQUE the two screws that attach the forward end of the aft inner liner to the aft inner liner forward bracket to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN).

(14) Replace and TORQUE the two screws that attach the aft end of the aft inner liner to the aft inner liner aft bracket to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN).



Thrust Reverser Bulb Seal
Figure 806

FAN ROTOR MIDSHAFT ASSEMBLY - DESCRIPTION AND OPERATION

1. General
The fan rotor midshaft transmits torque from the low pressure turbine rotor to the fan rotor.

2. Description
The fan midshaft assembly is a cylindrical structure consisting of a marage steel shaft, a stainless steel vent tube, and 3 titanium support assemblies. The shaft is splined at both ends and is attached to adjacent shafts by a marage steel coupling nut at either end. The vent tube is threaded into the shaft at the forward end. It is supported within the shaft at 3 locations by expandable collet type assemblies. The purpose of the tube is to vent the A sump.

FAN ROTOR MIDSHAFT ASSEMBLY - APPROVED REPAIRS

1. General

Repairs to the fan midshaft assembly are limited to the procedure that follows. It also gives instructions to examine and clean the oil from the fan mid-shaft.

2. Equipment and Materials

ITEM	DESIGNATION
A. 2C14685	Anti-Torque Stop Arm
B. 2C14794	Strap Set, Locking - Fan Rotor
C. 2C6876	Wrench - Center Vent Duct
D. 2C14811	No. 6 Bearing Plug Puller
E. 2C14846	CVT Removal/Installation Fixture
F. 6C2248	Spacer
G.	CVT Guide Tube Tool (HT-1204) (Locally Manufactured)
H.	Torque Multiplying Wrench (MSE-25)
I.	Pliers, Retainer Ring, Fan Mid/Forward Shaft. (MSE-66A)
J.	Solvent Applicator
K. Material No.C01-011	Adhesives, Plastics, Sealants (Ref. 70-00-00)
L. Material No.C01-084	Adhesives, Plastics, Sealants (Ref. 70-00-00)
M. Material No.C02-008	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
N. Material No.C02-058	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
O. Material No.C04-002	Cleaning Compounds and Solvents (Ref. 70-00-00)
P. Material No.C04-003	Cleaning Compounds and Solvents (Ref. 70-00-00)
Q. Material No.C04-005	Cleaning Compounds and Solvents (Ref. 70-00-00)
R. Material No.C10-012	Miscellaneous (Ref. 70-00-00)
Referenced Procedures	
- 72-21-00, P. Block 801	Fan Spinner
- 72-21-01, P. Block 401	No. 1 Bearing Manifold
- 72-58-02, P. Block 401	D-Sump Cover and Oil Slinger Seal

3. Removal of Oil from the Fan Midshaft

NOTE : This procedure is intended to correct high or varying fan vibration caused by oil in the fan mid shaft. The center vent tube must be removed to accomplish this repair.

A. Removal of the Center Vent Tube (Ref. Fig. 801, 802)

CAUTION : USE CAUTION TO PREVENT THE SPINNER CONE FROM FALLING WHEN RELEASED FROM THE FAN DISC.

(1)Remove fan rotor spinner (Ref. 72-21-00, P. Block 801)
NOTE : Do not loosen balance weight screws in the spinner cone.
(2)Install the locking strap set on the fan rotor.
NOTE : Installation instructions are on the placard in the container for the locking strap set.
(3)Remove No. 1 bearing manifold (Ref. 72-21-01, P. Block 401).

(4)Get access to the No. 6 bearing sump (D-sump) area as follows : (Ref. Fig. 804)
(a)Put Material No.C02-012 over the lube supply and oil scavenge openings in the D-sump area.
(b)Remove the D-sump cover (Ref. 72-58-02, P. Block 401).
(c)Remove the D-sump inner spanner nut nuts.
(d)Remove the oil slinger and integral ring seal.
NOTE : Keep the spanner nuts and the oil slinger. Discard the integral ring seal.
(e)Put tape over the LPT shaft and oil scavenge openings in the D-sump area.
(f)Use pliers (MSE-66A) and remove the LPT coupling nut retaining ring.
(5)Remove the CVT flame arrestor as follows :
(a)Slide the spacer, 6C2248, over the end of the flame arrestor as it extends from the end of the center vent tube. Move it in as far forward on the flame arrestor as it will go.
(b)Change tool 2C14811 to remove the flame arrestor as follows :
(c)Remove the three socket head screws and remove the nylon center post from 2C14811. The tool fingers can now move into the slots on the flame arrestor.
CAUTION : USE TOOL 2C14811 WITH THE SPACER, 6C2248, TO REMOVE THE FLAME ARRESTOR FROM THE CENTER VENT TUBE. IF NOT DONE CORRECTLY, DAMAGE TO THE CENTER VENT TUBE AND THE FLAME ARRESTOR CAN OCCUR.
(d)Use the tool 2C14811, with the spacer and remove the flame arrestor.
(6)Remove the retaining ring from the fan mid to forward shaft coupling nut using pliers, MSE-66A.
(7)Remove the center vent tube from the fan midshaft using center vent tube wrench, 2C6876.
(8)Use the wrench, 2C6876, and engage the wrench lugs with the forward wrenching slots in the forward end of the center vent tube (Ref. Fig. 805).
NOTE : You can hold the assembly in place by hand pressure or with a small diameter broom handle.
CAUTION : BECAUSE OF THE WEIGHT OF THE CVT REMOVAL/INSTALLATION FIXTURE 2C14846, IT IS NECESSARY FOR TWO PERSONS TO INSTALL IT.
(9)Engage the wrench extension arm into the wrench, 2C6876.
(10)Attach the local manufactured mounting plate/centering fixture to the spinner cone bolt circle with the four capscrews.
(11)If the inlet cowl is removed attach the anti-torque stop arm 2C14685, CVT Removal/Installation Fixture 2C14846, to the fan frame and spinner cone bolt circle. Attach the adapter to the 6 o'clock position on the spinner

cone bolt circle and to the 8 o'clock position on the forward fan case (the two positions are forward looking aft).

(12)If the inlet cowl is not removed, attach anti-torque stop arm 2C14685, CVT Removal/Installation Fixture 2C14846 to the fan frame and the spinner cone bolt circle. Attach the adapter to the 6 o'clock position on the spinner cone bolt circle and to the 8 o'clock position on the forward fan case (the two positions are forward looking aft).

(13)Attach torque multiplying wrench, MSE-25, to the forward end of the wrench extension arm. Remove the center vent tube from the fan mid-shaft forward ID threads.

(14)Make sure the center vent tube is disengaged from the fan mid-shaft ID threads.

(15)Remove the local manufactured mounting plate/centering fixture from the spinner cone bolt circle. Remove the wrench extension arm.

(16)Remove the adapter assembly wrench, 2C6876, from the center vent tube.

CAUTION : MAKE SURE THE CENTER VENT TUBE IS IN THE CENTER OF THE FAN MID-SHAFT. DO NOT LET THE CENTER VENT TUBE MOVE THE TUBE SUPPORTS FROM THEIR CORRECT POSITIONS. IF THE TUBE SUPPORTS ARE MOVED IN THE MID-SHAFT, AN ENGINE REMOVAL WILL BE NECESSARY.

(17)Put the locally manufactured tool (HT-1204) on the aft end of the center vent tube. If necessary use Material No.C10-012 to make sure the tool is tightly attached to the tube.

NOTE : This tool will help guide the center vent tube through the supports.

(18)Remove and discard the preformed packings from the three integral sup ports on the center vent tube.

(19)Remove and discard the four vespel inserts.

(20)Remove and discard the preformed packing at the aft end of the center vent tube.

B. Oil removal. If oil is found in the fan midshaft, remove it as follows :

NOTE : When oil is present, it is usually in a puddle or pool on the inner surface of the fan midshaft.

(1)Remove the oil by mopping or swabbing the inner diameter of the fan mid-shaft with a dry shop cloth.

NOTE : A mop may be made by attaching the shop cloth to the end of a wood handle or stick approximately four or five feet (1.2-1.5 meters) in length.

WARNING : AVOID APPLYING EXCESSIVE QUANTITIES OF SOLVENT INTO THE FAN MIDSHAFT DURING THE CLEANING PROCESS. USE A SUCTION LINE IN CONJUNCTION WITH THE EQUIPMENT OUTLINED ABOVE TO PREVENT SOLVENT FROM FLOWING THRU THE MIDSHAFT AND INTO THE LPT CAVITY. THIS SOLVENT IS FLAMMABLE ; TAKE PRECAUTION AGAINST FIRE.

WARNING : SOLVENTS ARE TOXIC. AVOID INGESTION, BREATHING THE VAPORS, AND CONTACT WITH THE SKIN AND EYES.

(2)Clean the oil from the inner surface of the fan midshaft using cleaning solvent (C04-002). Locally procurable equipment is recommended for applying the solvent. A conceptual sketch is shown (Ref. Fig. 803)

(3)Repeat the procedure above until the oil is completely removed from the

inner surface of the fan midshaft.

NOTE : The entrapped oil may be very viscous and, therefore, may require several cleaning/ scrubbing applications.

C. Installation of the Center Vent Tube (Ref. Fig. 801, 802, 804) (Ref. Fig. 805)

NOTE : Before installing the center vent tube into the fan midshaft, install the locking strap set, 2C14794, onto the fan rotor. Installation instructions are on the placard in its container.

(1)Clean the inside diameters of the four insert holes using solvent (C04-003 or C04-005).

(2)Install a Vespel insert into each of the four insert holes at the forward end of the center vent tube.

(3)Lubricate Area G with a generous application of anti-seize compound (C02-058).

(4)Coat Area J with sealant (C01-084).

(5)Fill the four insert holes with epoxy (C01-011) from the inside diameter of the center vent tube. Overlap the inside diameter of the tube to a radial thickness of 0.01-0.07 in. (0.3-1.8 mm). Allow one hour for the epoxy to set before installation into the engine.

(6)Lubricate three preformed packings with engine oil. Install one preformed packing into each ring groove of the integral supports on the center vent tube.

NOTE : To facilitate reinstallation of the center vent tube, it is recommended that prior to its reinstallation, the three preformed packings be compressed (using hose clamps or equivalent) and chilled with Dry Ice.

(7)Lubricate a preformed packing with Material No.C02-008 and install into the groove at the aft end of the center vent tube (three are located at the support location and one at the aft end of the tube).

CAUTION : MAKE SURE THE CENTER VENT TUBE IS IN THE CENTER OF THE FAN MID-SHAFT. DO NOT LET THE CENTER VENT TUBE MOVE THE TUBE SUPPORTS FROM THEIR CORRECT POSITIONS. IF THE TUBE SUPPORTS ARE MOVED IN THE MID-SHAFT, AN ENGINE REMOVAL WILL BE NECESSARY.

(8)Put the locally manufactured tool (HT-1204) on the aft end of the center vent tube. If necessary use Material No.C10-012 to make sure the tool is tightly attached to the tube.

NOTE : This tool will help guide the center vent tube through the supports.

(9)Install the center vent tube into the forward end of the fan midshaft. Slowly slide the center tube into the engine.

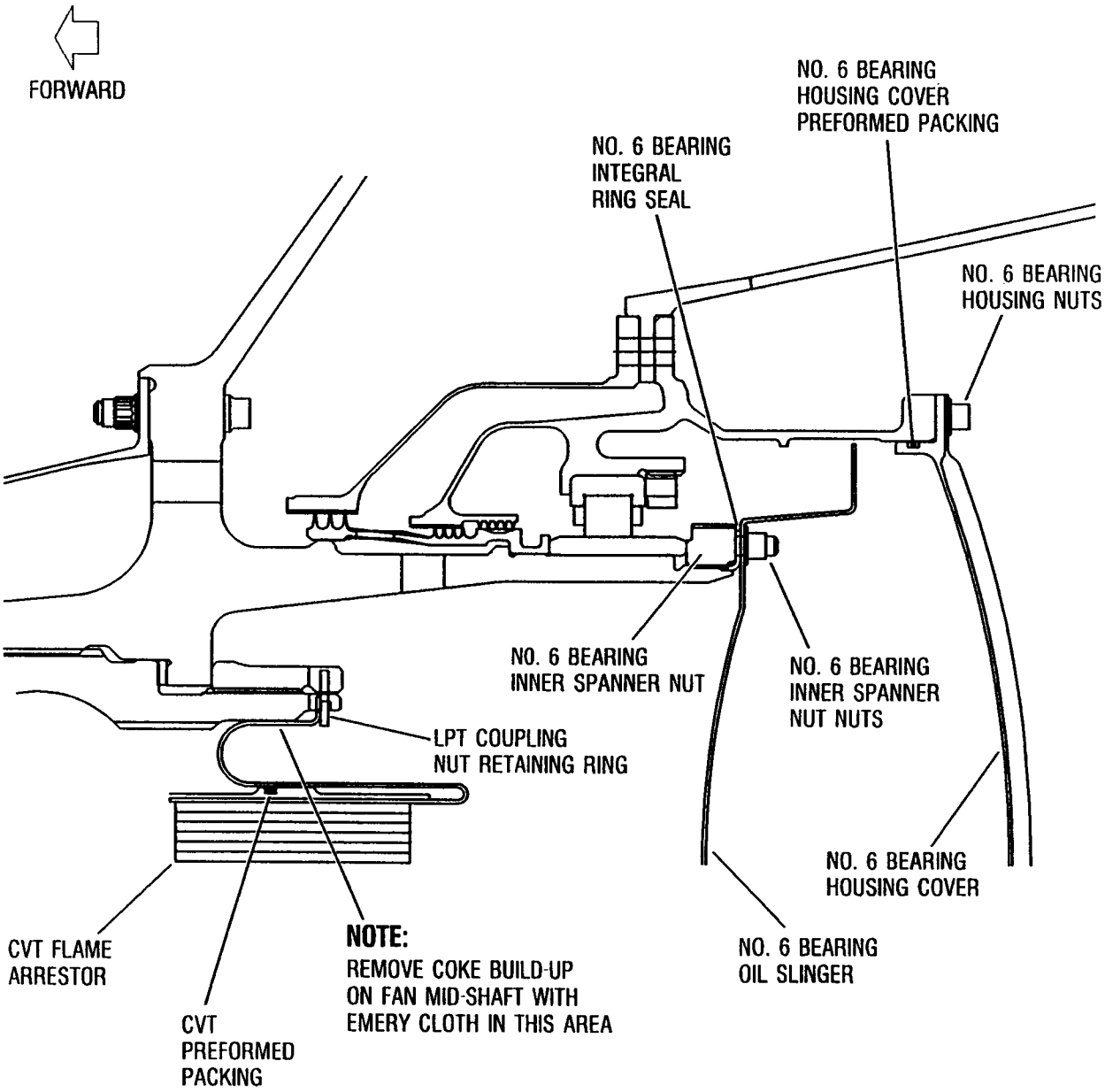
(10)Engage the threads of the center vent tube assembly with the threads of the fan mid shaft assembly. A slight turning motion can help move the center vent tube supports to the tube supports of the fan mid-shaft.

(11)Use the wrench, 2C6876, and engage the wrench lugs with the forward wrenching slots in the forward end of the center vent tube.

NOTE : You can hold the assembly in place by hand pressure or with a small diameter broom handle.

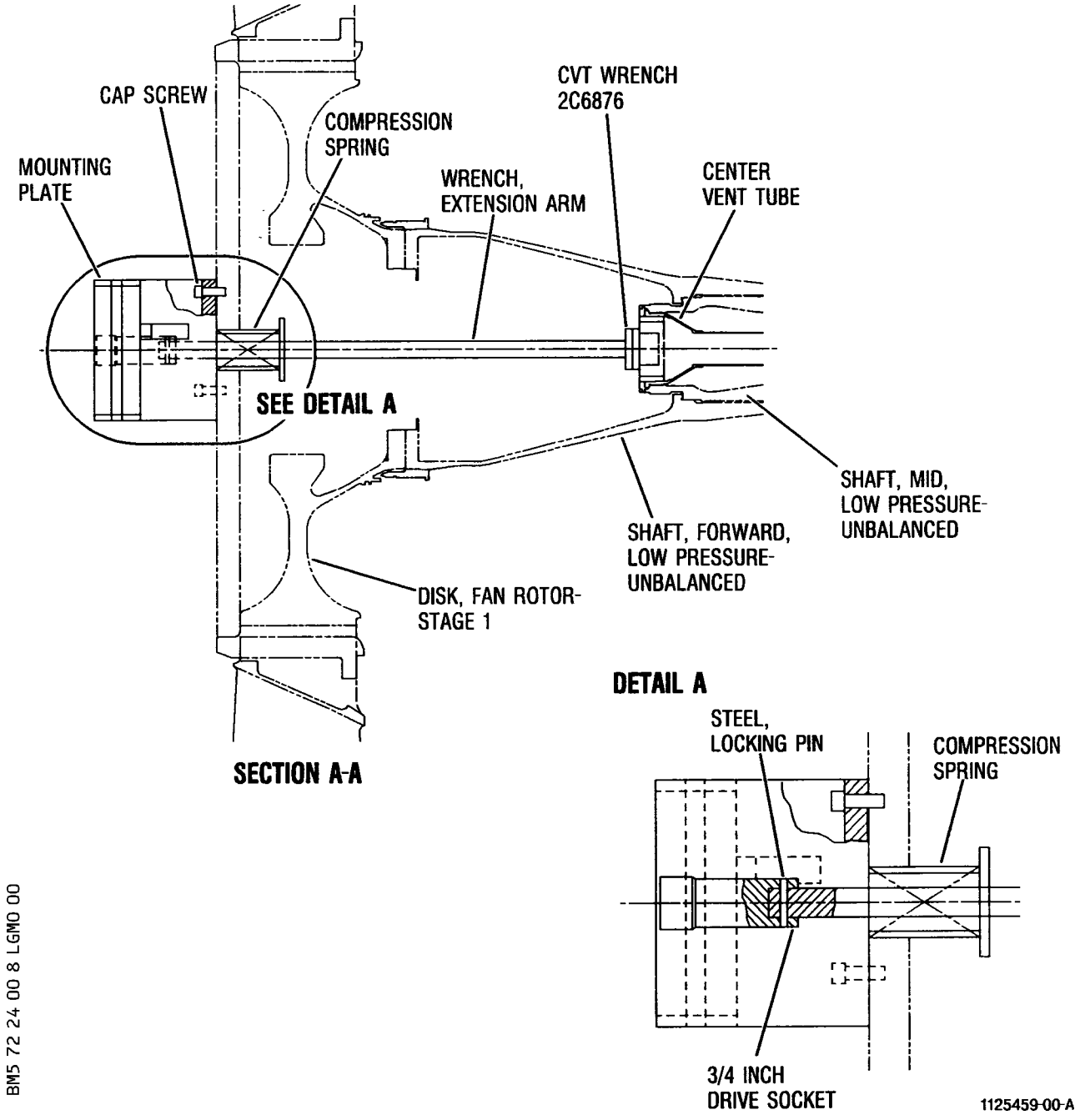
(12)Engage the wrench extension arm into the wrench, 2C6876.

(13)Attach the 2C14846 mounting plate/centering fixture to the spinner cone


FORWARD
NO. 6 BEARING HOUSING COVER PREFORMED PACKING
NO. 6 BEARING INTEGRAL RING SEAL
NO. 6 BEARING HOUSING NUTS
NO. 6 BEARING INNER SPANNER NUT
NO. 6 BEARING INNER SPANNER NUT NUTS
LPT COUPLING NUT RETAINING RING
NO. 6 BEARING HOUSING COVER
CVT FLAME ARRESTOR
NOTE:
REMOVE COKE BUILD-UP ON FAN MID-SHAFT WITH EMERY CLOTH IN THIS AREA
NO. 6 BEARING OIL SLINGER
CVT PREFORMED PACKING
1125458-00-A

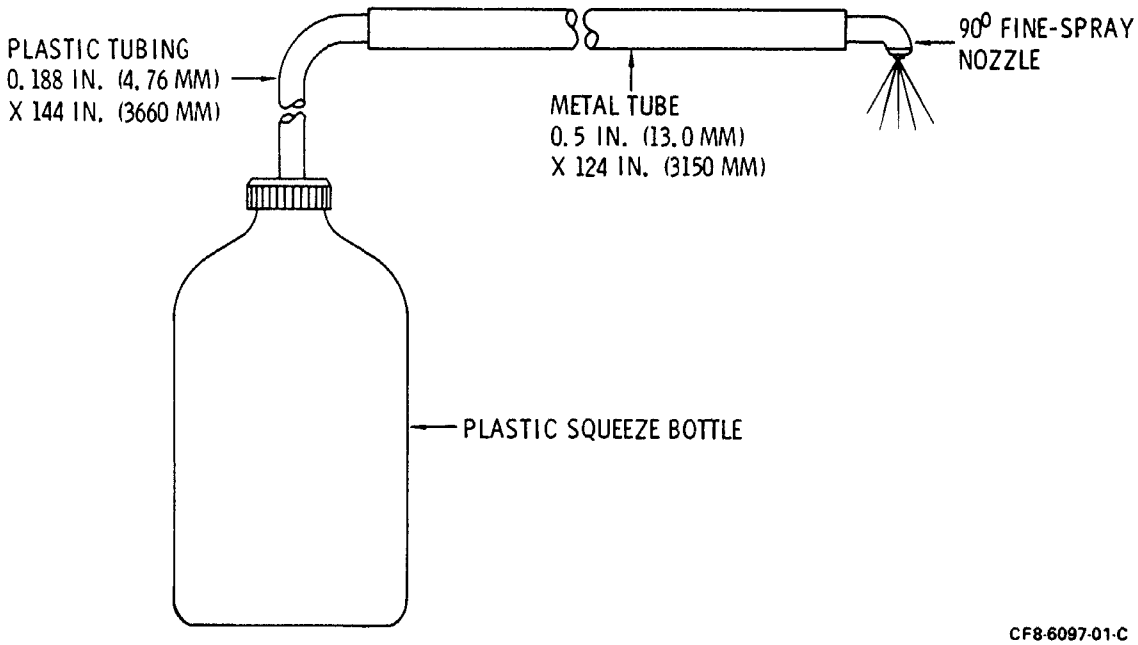
BM5 72 24 00 8 LEMO 00

CVT Flame Arrestor
Figure 801



BM5 72 24 00 8 LGM0 00

CVT Removal/Installation
Figure 802



BMS 72 24 00 8 LAMO - 13 - 08
DM5

Locally - Manufactured Fan Midshaft Solvent Applicator
Figure 803

bolt circle with the four capscrews.

(14)If the inlet cowl is removed attach the anti-torque stop arm 2C14685, CVT Removal/Installation Fixture 2C14846, to the fan frame and spinner cone bolt circle. Attach the adapter to the 6 o'clock position on the spinner cone bolt circle and to the 8 o'clock position on the forward fan case (the two positions are forward looking aft).

(15)If the inlet cowl is not removed, attach anti-torque stop arm 2C14685, CVT Removal/Installation Fixture 2C14846 to the fan frame and the spinner cone bolt circle. Attach the adapter to the 6 o'clock position on the spinner cone bolt circle and to the 8 o'clock position on the forward fan case (the two positions are forward looking aft).

(16)Attach torque multiplying wrench to the forward end of the wrench extension arm.

(17)Turn the assembly until the inserts are fully engaged with the mid shaft threads. Record run-on torque.

NOTE : The vent tube torque must not be more than 1800 lbf.in. (20.34 m.daN).

(18)Turn the center vent tube assembly in the opposite direction until the threads are fully disengaged.

(19)Do the torque cycle again and make a record of the results of the run-on torque.

(20)TORQUE the center vent tube assembly to between 1200 and 1440 lbf.in. (13.56 and 16.27 m.daN) more than the run-on torque.

NOTE : The vent tube torque must not be more than 1800 lbf.in. (20.34 m.daN).

(21)Remove tool (HT-1204) from the aft end of the center vent tube through the aft end of the engine.

(22)Use a clean cloth to wipe the lubricant and sealant residue that has been pushed out from the threads of the forward end of the center vent tube. Make sure that the snap ring groove is clear of all residue.

(23)Remove the mounting plate/centering fixture from the spinner cone bolt circle. Remove the wrench extension arm.

(24)Remove the adapter assembly from the center vent tube.

(25)Install the fan forward/fan midshaft coupling nut retaining ring over the coupling nut using pliers, MSE-66A.

(26)Install the CVT flame arrestor as follows (Ref. Fig. 804)

(a)Clean the inside diameter of the aft fan mid-shaft with emery cloth in a 360 degree circle.

(b)Wipe residual dirt/filings from the surface before applying Material No.C02-008.

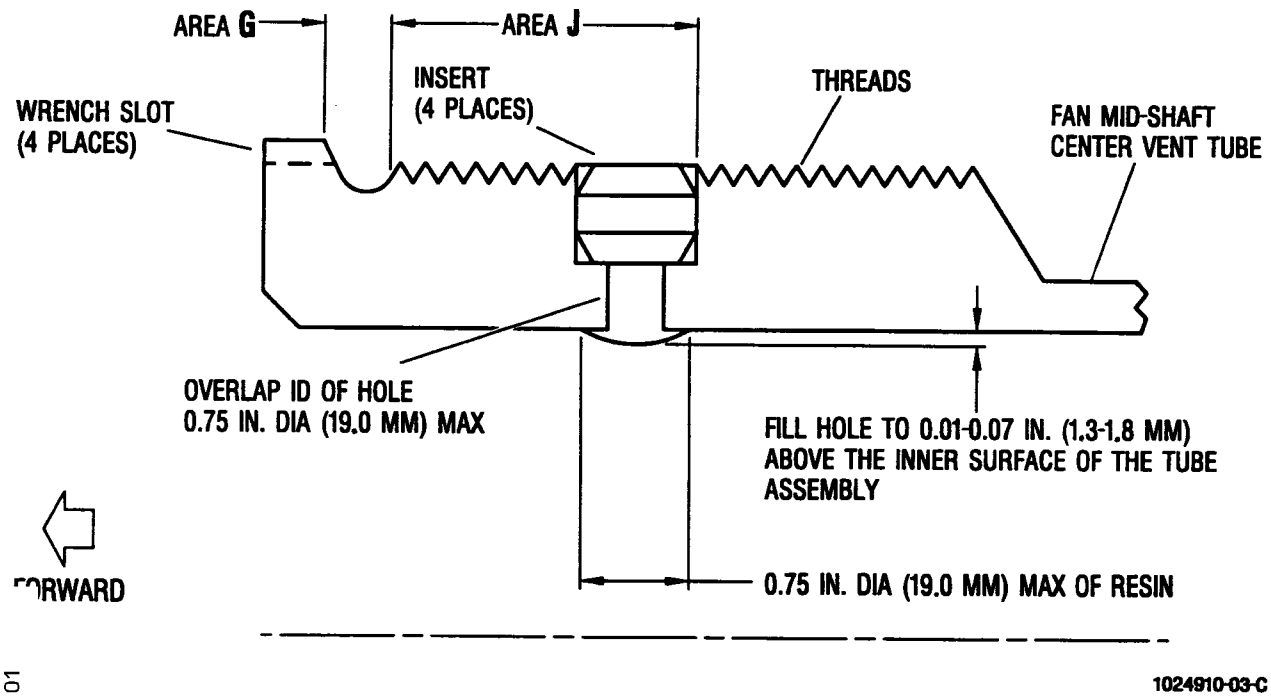
(c)Put a small amount of Material No.C02-008 in a 360 degree circle to the inside diameter of the fan mid-shaft where the flame arrestor will be installed.

WARNING : DO NOT LET THE DRY ICE TOUCH YOUR SKIN. DO NOT INHALE THE VAPORS FOR A LONG TIME. USE APPROVED PROTECTIVE GLOVES WHEN TOUCH DRY ICE OR PARTS CHILLED BY DRY ICE. IT WILL CAUSE SEVERE BURNS, OR FROSTBITE.

(d)Place the flame arrestor in the dry ice for 15 to 20 minutes.

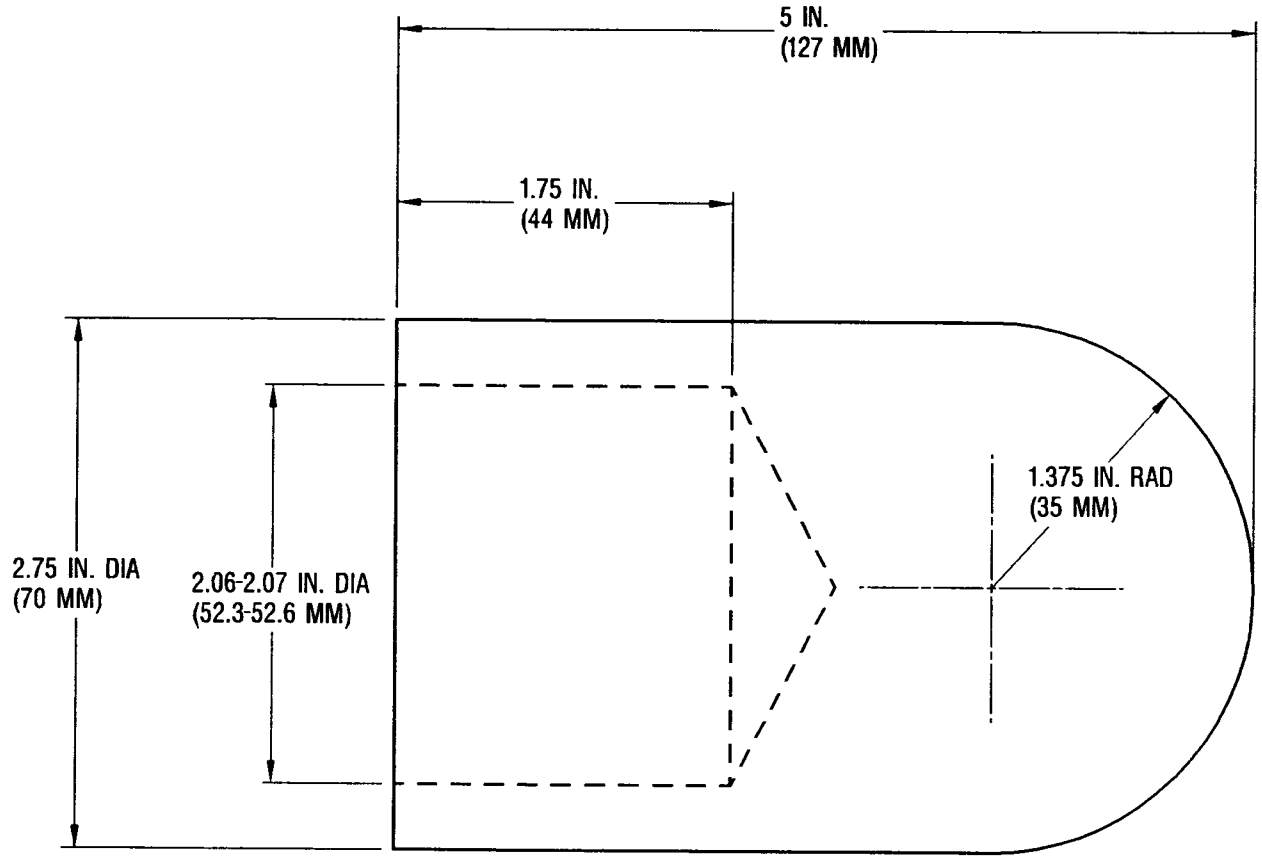
(e)Remove the flame arrestor from the dry ice.

(f)Align the tab on the flame arrestor with one of the tang slots in the fan mid-shaft.



BM5 72 24 00 8 LCM0 01

Threads on the forward End of the Center Vent Tube
Figure 804



BM5 72 24 00 8 LJMO 00

MATERIAL: PLEXIGLAS

1125457-00-A

Tube Guide Tool HT-1204
Figure 805

(g)Install the flame arrestor in the fan mid-shaft until it is fully seated.
NOTE : It may be necessary to lightly hit the flame arrestor into position with a rubber mallet or equivalent.
(h)Remove the tape that is on the openings from the inside of the D-sump area.
(i)Use the pliers, MSE-66A, and install the LPT coupling nut retaining ring.
(j)Put a small amount of Material No.C02-008 to both faces of the new integral ring seal.
(k)Install the oil slinger on the spanner nut studs with nut. Make sure the integral ring seal tabs are forward.
(l)TORQUE the nuts to between 33 and 37 lbf.in. (0.37 and 0.42 m.daN).
(m)Install the D-sump cover (Ref. 72-58-02, P. Block 401).
(27)Install No. 1 bearing manifold (Ref. 72-21-01, P. Block 401).
(28)Install the fan rotor spinner (Ref. 72-21-00, P. Block 801).
(29)Remove the locking strap set from the fan rotor.

FAN STATOR ASSEMBLY - DESCRIPTION AND OPERATION

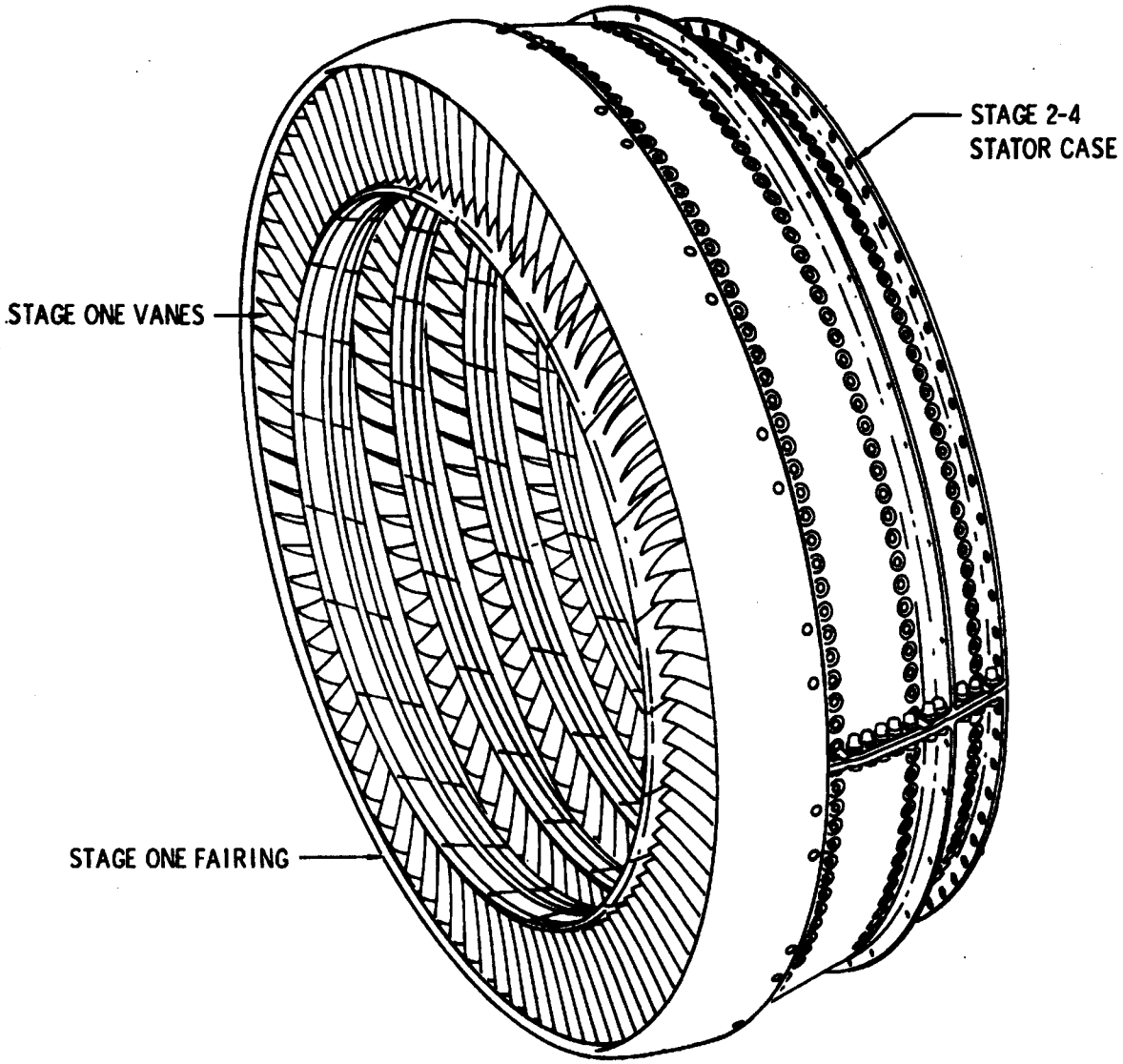
1. General (Ref. Fig. 001)
The fan stator assembly is a major subassembly of the fan module. When the fan stator assembly is coupled with the fan rotor assembly the low pressure compressor is formed. The fan stator assembly consists of the stage one vane sectors, stage one fairing, stages 2 through 4 stator case, and stages 1 through 4 vane sectors.

2. Fan Stator Assembly

A. Stages 2 through 4 Casing
(1) The stages 2 through 4 fan stator casing is the main supporting member of the fan stator assembly.
Besides housing the stages 2 through 4 fan stator vanes, the casing supplies an attachment point for the stage one vanes, stage one fairing, fan case outlet guide vanes and fan frame inner liner segment brackets. The casing also provides the mounting flange to the fan frame via the stage 5 fan stator case.
(2) The casing consists of two 180° cases. The cases, which are made of aluminum, are machined to be a matched set. The inner diameter of the casing contains 3 abradable Teflon strips used as the outer shroud for the stages 2 through 4 fan rotor blades.

B. Stage One Fairing
The stage one fairing is a single 360° piece of aluminum. It houses the stage one vanes which hook into slot on the forward inner diameter of the fairing. The fairing forms the splitter between fan bypass air and the booster inlet air.

C. Vane Sectors
(1) Each of the stage 1 through 4 vane sectors consists of titanium vanes which are bonded into a preformed inner shroud. Abradable seals are then bonded to the inner diameter of the preformed shrouds.
(2) Stage one vane assembly contains 96 vanes divided up within 24 stage one vane sectors. The stage one vanes are the longest of the stator vanes. The 24 vane sectors are bonded to an aluminium ring to form an inseparable subassembly. The subassembly is bolted to the stages 2-4 booster stator case forward flange.
(3) Stages 2 and 3 vane assemblies each contain 130 vanes divided up within 26 vane sectors. Each vane sector bolts to the stages 2-4 booster case at the vane platform spindle.
(4) Stage 4 vane assembly contains 140 vanes divided up within 28 vanes sectors. Each vane sector bolts to the stages 2-4 booster case at the vane platform spindle.



BM5 72 25 00 0 LAM0 00

Fan Stator Assembly
Figure 001

FAN STATOR ASSEMBLY - INSPECTION/CHECK

1. General

A. This section provides information on the methods of inspecting the fan stator assembly.

B. Maintenance of the fan stator assembly is limited to external areas.

2. Visual Inspection/Check

CAUTION : DO NOT PROCESS TITANIUM PARTS IN HALOGEN - CONTAINING COMPOUNDS.

A. Visually inspect the fan stator assembly for the following. Confirm suspected cracks by spot fluorescent penetrant inspection.

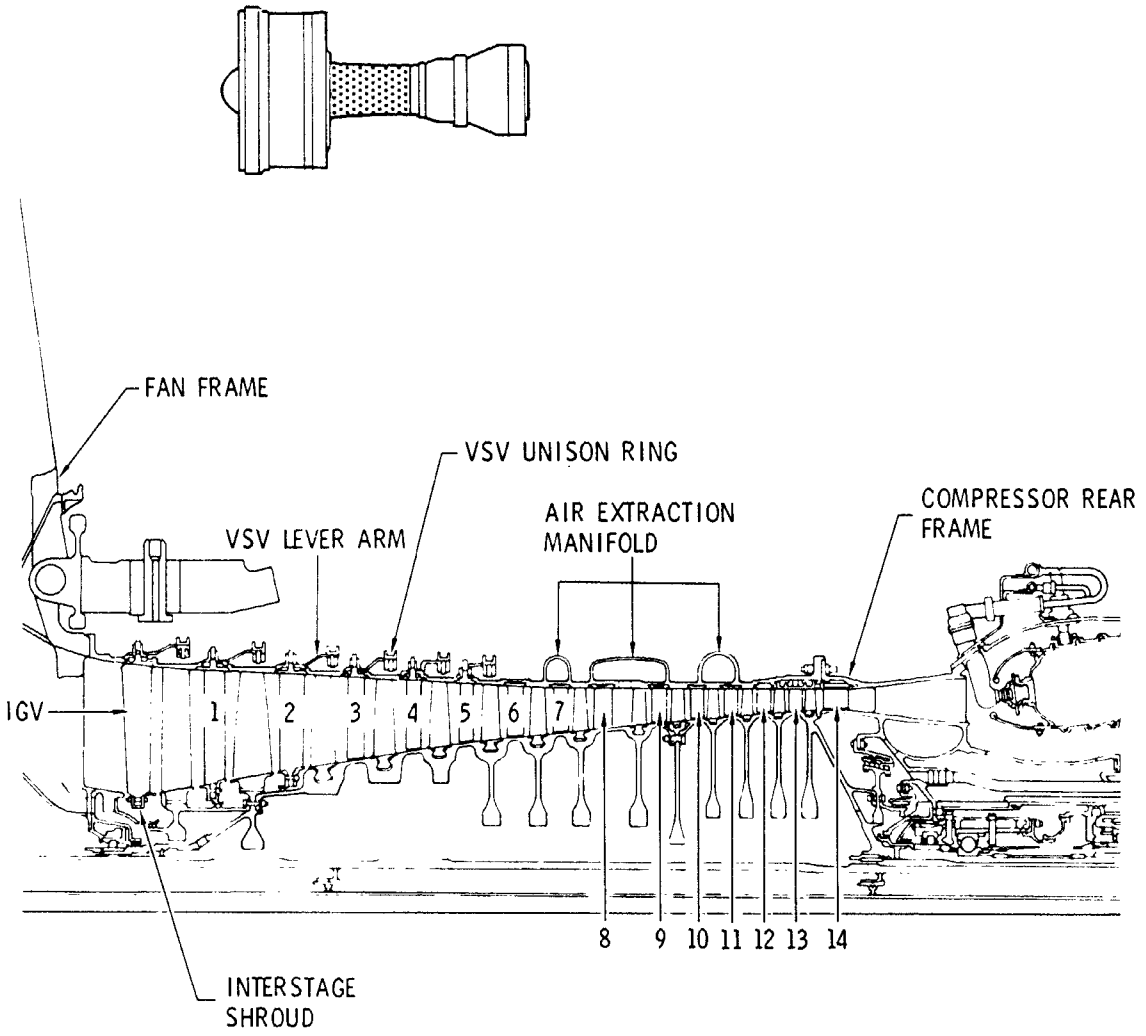
INSPECTION/CHECK	MAX. SERVICEABLE LIMITS	REMARKS
(1)Stage 1, 2, 3, 4 and 5 Vanes for :		
(a)Tears in airfoil	0.125 in. (3.18 mm) long provided the blades are serviceable	
(b)Dents in airfoil	Any number with a smooth contour 0.060 in. (1.52 mm) deep	
(c)Nicks and scratches within 0.50 in. (12.7 mm) of root radius	Any number 0.030 in. (0.76 mm) deep	
(2)Fairing For :		
(a)Cracks	Four per fairing emanating from screw holes to aft edge. None allowed in other areas	
(b)Nicks and scratches	Any number 0.06 in. (1.5 mm) deep on leading edge, 0.03 in. (0.8 mm) deep for remaining area with a minimum separation of 0.25 in. (6.4 mm)	
(c)Dents	Any number with a smooth contour 0.12 in. (3 mm) deep	
(3)Teflon Shrouds for :		
(a) Missing or damaged material	Any amount	

COMPRESSOR SECTION - DESCRIPTION AND OPERATION

1. General (Ref. Fig. 001)

The major components of the compressor are : compressor rotor, compressor stator, and the compressor rear frame. A portion of the fan discharge airflow passes through the compressor. The front of the compressor stator is supported by the fan frame and the compressor rotor is supported by a bearing in the fan frame. The rear of the compressor stator is supported by the compressor rear frame, and the rear of the rotor is supported by two bearings in the compressor rear frame.

- Air, taken in through the fan section, passes through successive stages of compressor rotor blades and compressor stator vanes, being compressed as it passes from stage to stage. After passing through 14-stages of blades, the air has been compressed by a ratio of approximately 12 to 1.
- The inlet guide vanes and the first 5 stages of the stator are variable, and change their angular position as a function of compressor inlet temperature and engine speed. The purpose of this variability is to optimize efficiency and stall margin for engine speed, compressor inlet temperature and pressure conditions.
- The combustion lines assembly is housed in the compressor rear frame.



CF8-6716-00-A

BM5 72 30 00 0 LCMO 13 07
DM5

HP Compressor Section
Figure 001

COMPRESSOR ROTOR - INSPECTION/CHECK

1. General
   Maintenance of the compressor is limited to inspection of those areas that can be seen.
   Use a borescope.

2. Borescope Inspection/Check

A. Equipment and Materials

ITEM	DESIGNATION
(1)Material No.C10-071	Miscellaneous (Ref. 70-00-00)
(2)2C6388	Borescope Set, Fiber Light
Referenced Procedures	
- 72-31-00, P. Block 801	Compressor Rotor
- 72-00-00, P. Block 601	Engine
- 72-00-00, P. Block 701	Engine
- 71-00-00, P. Block 501	Power Plant
- 71-00-00, P. Block 401	Power Plant

B. Procedure
   (1)Remove borescope plugs as required (Ref. 72-00-00, P. Block 601) for port location.
   NOTE : When removing borescope plugs near the aft end of the compressor stator case, be careful not to confuse these plugs with vane retaining liner bolts.
   (2)Perform borescope inspection, use a tool 2C6388G06 or G07.
   (3)When inspection is complete, replace the borescope plugs, torque to the specification, (Ref. 72-00-00, P. Block 601) and wirelock.
   NOTE : For manual N2 rotor cranking (Ref. 71-00-00, P. Block 501).

C. Inspect the following :
   NOTE : If the stages 1 through 14 blades have damage that is more than the maximum serviceable limits, blades can be boroscope blend repaired (Ref. 72-31-00, P. Block 801).

INSPECTION/CHECK	MAX. SERVICEABLE LIMITS	REMARKS
(1)Rotor blades for :		
(a)Cracks	On the 12th thru 14th stage blades only : the cracks must be in a radial direction along the tip of the blade. For all other stages : see limit extensions (Ref. 72-00-00, P. Block 601).	See limit extensions (Ref. 72-00-00, P. Block 601).
(b)Nicks and dents on airfoil center	Any amount, any depth, if damage does not form a line	

INSPECTION/CHECK	MAX. SERVICEABLE LIMITS	REMARKS
panel	transverse to airfoil ; damage is 0.2 in. (5 mm) from leading or trailing edge ; damage does not break through (protrusion ac acceptable) ; damage is less than 0.15 in. (3.8 mm) in diameter	
NOTE : All limits for the leading edge of the blade apply to the area from the leading edge to 0.199999 in. (5.0799 mm) from the leading edge. All Limits for the trailing edge of the blade apply to the area from the trailing edge of the blade to 0.199999 in. (5.0799 mm) from the trailing edge. NOTE : Some engines contain a stage 1 blade configuration which has a bulge in the airfoil leading and trailing edge. The bulge is located radially in-line with the mid-span shroud. This bulge is part of the blade design and not a defect or dent.		
(c)Tears, nicks, cracks, missing material and dents on airfoil leading and trailing edges	Stages 1 thru 9 blades : Any number of nicks, missing material and dents up to 0.050 in. (1.27 mm) maximum depth are serviceable. The blade must not be torn or distorted. Torn or cracked edges are not serviceable.	If damage is beyond maximum serviceable limits, do the HPC blend repair (Ref. 72-31-00, P. Block 801) or remove engine (Ref. 71-00-00, P. Block 401).
Post GE SB 72-975 stage 3 blades only		
	No damage permitted in outer 2 inches of blade. For the rest of the blade, all other limits apply. NOTE : GE SB 72-975 blades are marked with a "T" on the blade platform.	If the damage is beyond the maximum serviceable limits, do the HPC blend repair (Ref. 72-31-00, P. Block 801) or remove the engine (Ref. 71-00-00, P. Block 401). Over extension limits do not apply.
End Post GE SB 72-975 stage 3 blades only		
	Stages 10 thru 12 blades : Damage that is less than	

INSPECTION/CHECK	MAX. SERVICEABLE LIMITS	REMARKS
	0.30 in. (7.6 mm) from tip : Any number of nicks, missing material and dents up to 0.050 in. (1.27 mm) maximum depth are serviceable. The blade must not be torn, cracked or distorted. Nicks, dents, and missing material less than 0.120 in. (3.05 mm) in depth, or cracks and tears less than 0.120 in. (3.05 mm) in length are serviceable if no more than six blades in each stage are damages. Damage more than 0.30 in. (7.6 mm) from the tip : Any number of nicks, missing material and dents up to 0.050 in. (1.27 mm) maximum depth are serviceable. The blade must not be torn or distorted. Torn or cracked edges greater than 0.30 in. (7.6 mm) from the tip are not serviceable. Stage 13-14 blades : If the damage is less than 0.50 in. (12.7 mm) from the tip : All nicks, missing material and dents are permitted, if not more than 0.05 in. (1.3 mm) in depth, and the blade is not torn, cracked or bent. Nicks, dents, and missing material less than 0.120 in. (3.05 mm) in depth, or cracks and tears less than 0.120 in. (3.05 mm) in length are serviceable if no more than six blades in each stage are damaged. If the damage is more than 0.50 in. (12.7 mm) from the tip : All nicks, missing material and dents are permitted, if not more than 0.05 in. (1.3 mm) in depth, and the blade is not torn or bent. Torn or cracked edges are not permitted.	
(d)Tip corner that is gone	Maximum of 6 blades per stage with only one missing corner per	Borescope downstream of stages

INSPECTION/CHECK	MAX. SERVICEABLE LIMITS	REMARKS
(See NOTE 1)	blade. Downstream damage must be serviceable and core vibrations must be in the limits. Refer to paragraph (2) for stage 1 blade Max. Serviceable Limits because of inlet guide vane (IGV) contact NOTE : For example, if a stage 2 blade has a missing corner, the HPC blades aft of stage 2 must be inspected for signs of impact damage because the released tip corner could impact blades in a number of aft stages.	with pieces that are gone
(e)Tip clang marks	No maximum limit, if a tip is not cracked	See Note
NOTE : Defects of this type are indicative of a Compressor Hard Stall. Ref. 72-00-00, P. Block 601, for detailed information concerning the compressor assembly.		
(f)Tip Curl		
Stages 1-9 Blades	Permitted if less that 50 % of the blade chord is curled and it does not engage parts that do not move during operation. There must be no other unserviceable damage. Not permitted if more than 50 % of the blade chord is curled. This damage is not repairable - remove the engine.	
Stages 10-14 Blades	Permitted if it does not engage parts that do not move during operation. There must be no other unserviceable damage.	
(g)Bent Blades		
Stages 1-9 Blades	Blade bending resulting in kinks in blade edges and uneven blade tip spacing is not permitted. See NOTE 1A. This damage is not repairable - remove the engine.	

INSPECTION/CHECK	MAX. SERVICEABLE LIMITS	REMARKS
Stages 10-14 Blades	Permitted if it does not engage parts that do not move during operation. There must be no other unserviceable damage.	
(h)Tears, nicks, dents and metal that is gone from the squealer tip area	Permitted, if the damage is in the squealer tip area	
(i)Corrosion and dirt	Permitted, but a large quantity of deposits can affect the engine performance	Clean compressor (Ref. 72-00-00, P. Block 701).
(j)Aluminum or abrasive deposits on blades (leading edge especially)	Permitted, but a large quantity of deposits can affect the engine performance	Too much deposit can cause a stall and loss of performance margin. Coke clean or water wash compressor (Ref. 72-00-00, P. Block 701).
NOTE : Heavy aluminum deposits on blades may be something that is shown as a Compressor Hard Stall. See 72-00-00, P. Block 601, for detailed information concerning the compressor rotor assembly.		
(k)Platform shingling	Not serviceable	
(l)Platform of locking blades for :		
1 Cracks	Not serviceable	
(m)Burrs and high metal on blade tips due to rub	Any amount	

NOTE 1 : (Ref. Fig. 604)
NOTE 1A : (Ref. Fig. 605)

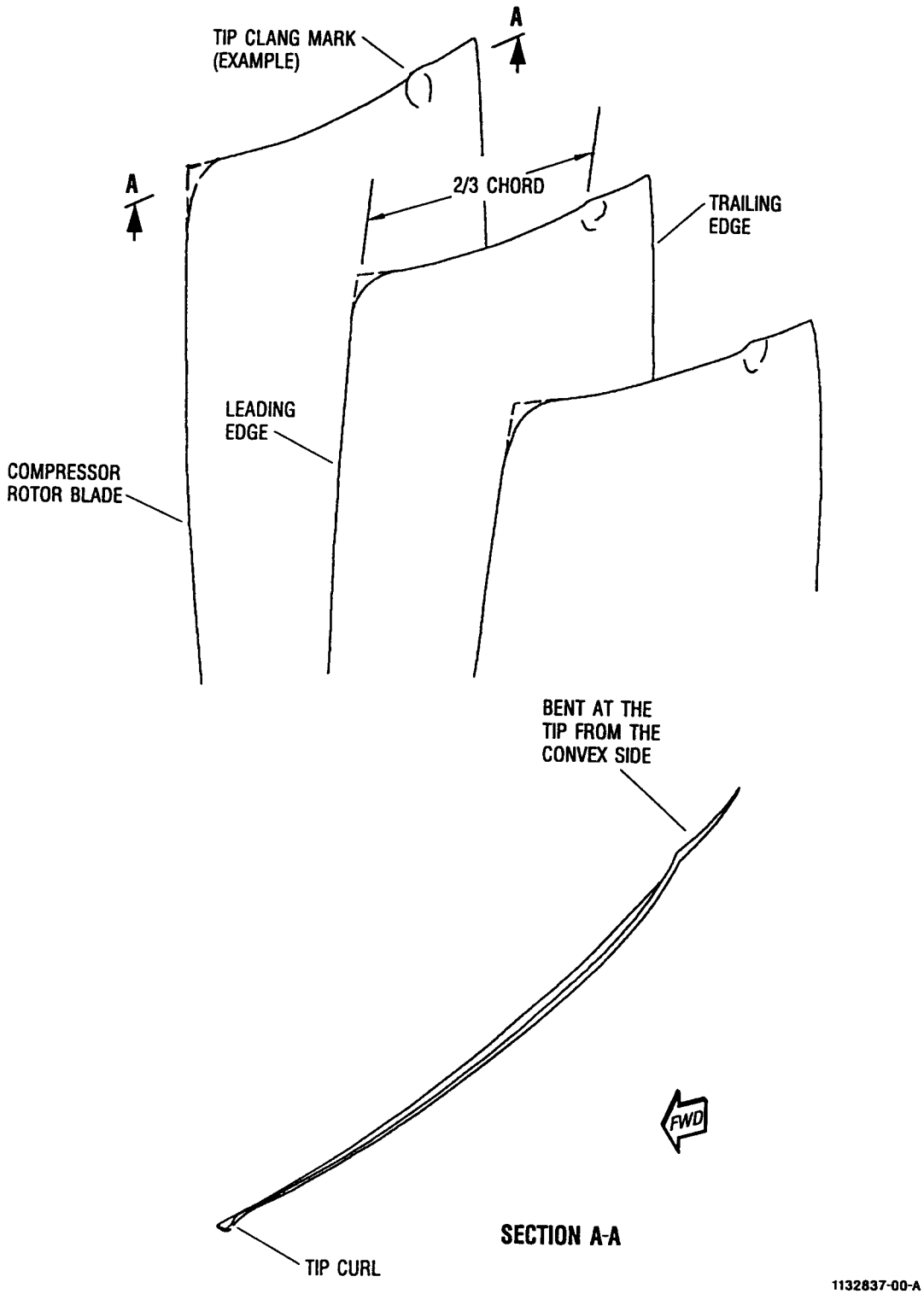
INSPECTION/CHECK	MAX. SERVICEABLE LIMITS	REMARKS
(2)Additional to the above Maximum Serviceable Inspection Limits, do an inspection of the 1st-stage HPC blades for the conditions that follow : (See NOTE 2, NOTE 3, and NOTE 4)		

INSPECTION/CHECK	MAX. SERVICEABLE LIMITS	REMARKS
(a)Damage to 1St stage blade because of inlet guide vanes (IVG)/1st-stage blade contact. (See NOTE 3)	Permitted, if the total damage is not more than 1.0 square in. (6.5 square cm) on a maximum of four blades. The damage must be no more than 0.75 in. (19.1 mm) from the leading edge and 2.0 in. (51 mm) from the blade tip.	If the damage is more than 1.0 in. (25 mm) from the blade tip, you must blend the leading edge. Do the HPC stage 1 blade repair (Ref. 72-31-00, P. Block 801). You must blend repair (Ref. 72-31-00, P. Block 801) before 10 flight cycles (maximum).
(b)Shingling of the stage 1 blades	Not permitted	Unshingle blades (Ref. 72-31-00, P. Block 801)
(c)Signs that shingling on the upper/lower midspan shroud surfaces has occurred-scratches or gouges	Permitted if : 1) The blades are no longer shingled 2) There are no dents on the airfoil panel or on the mid-span fillet directly above or below the mid-span shrouds 3) There is no other unserviceable damage	
(d)Dents in the airfoil or mid-span shroud trailing edge fillet in the area of the mid-span shrouds caused by contact from the adjacent blade mid-span	Serviceable if the dent is in the area AFT of the mid-span shrouds and there is no other unserviceable damage. Dents are not permitted to show through to the other side of the blade. Dents above or below the mid-span shrouds are not serviceable.	
(e)Mid-span shroud tip damage and missing tip corner material.	Serviceable	
(f)The carboloy pad	Serviceable	

INSPECTION/CHECK	MAX. SERVICEABLE LIMITS	REMARKS
for wear (see NOTE 4)		
(g)Cracks in carboloy pad (see NOTE 4)	Permitted, if no more than 0.150 in. (3.81 mm) missing pad material, and no parent metal wear.	
(h)A piece of the carboloy pad is gone. No more than 0.150 in. (3.81 mm) axial length of the pad is gone	Permitted	
NOTE : The dimension 0.15 in. (3.81 mm) is equal to approximately 20 % of the carboloy pad total axial length.		
(i)A piece of the carboloy pad is gone. More than 0.150 in. (3.81 mm) axial length of the pad is gone.	Permitted if : 1) There are no signs of wear in the mid-span shroud parent metal. 2) You must do an inspection before 25 flight cycles, there must be no sign of wear in the parent metal 3) You must do subsequent inspections each 200 flight cycles (maximum). There must be no signs of wear in the parent metal of the mid-span shroud.	
NOTE : The dimension 0.15 in. (3.81 mm) is equal to approximately 20 % of the carboloy pad total axial length.		
(j)Signs of wear in the parent metal of the mid-span shroud.	Not permitted.	
NOTE : Wear of the mid-span shroud parent metal occurs because of damaged or missing carboloy pad material. This lets the parent metal of the mid-span shroud touch the mid-span shroud of the adjacent blade.		
(3)Rotor Spools and Disks for :		

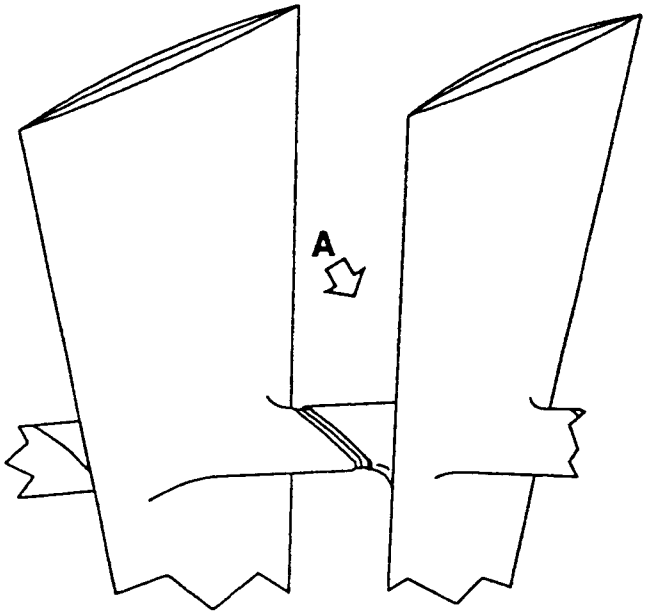
INSPECTION/CHECK	MAX. SERVICEABLE LIMITS	REMARKS
(a)Rub coat missing	Any amount	Excessive amounts can result in loss of stall and performance margin. Remove the engine if damage is more than the limit.
(b)Spool land rubs on stages 10 thru 13 vane lands that show parent metal (caused by vane tip to spool land contact).	Permitted three rub spots with a maximum circumferential length of 1.0 in. (25.4 mm) each and apart by a minimum of 2.0 in. (50.8 mm) each.	Remove the engine if damage is more than the limit.
	Permitted three rub spots with a maximum circumferential length of 1.0-2.0 in. (25.4-50.8 mm) each and apart by a minimum of 6.0 in. (152.4 mm) each.	Remove the engine if damage is more than the limit.

NOTE 2 : (Ref. Fig. 601, 602, 603)
NOTE 3 : (Ref. Fig. 603)
NOTE 4 : (Ref. Fig. 602)

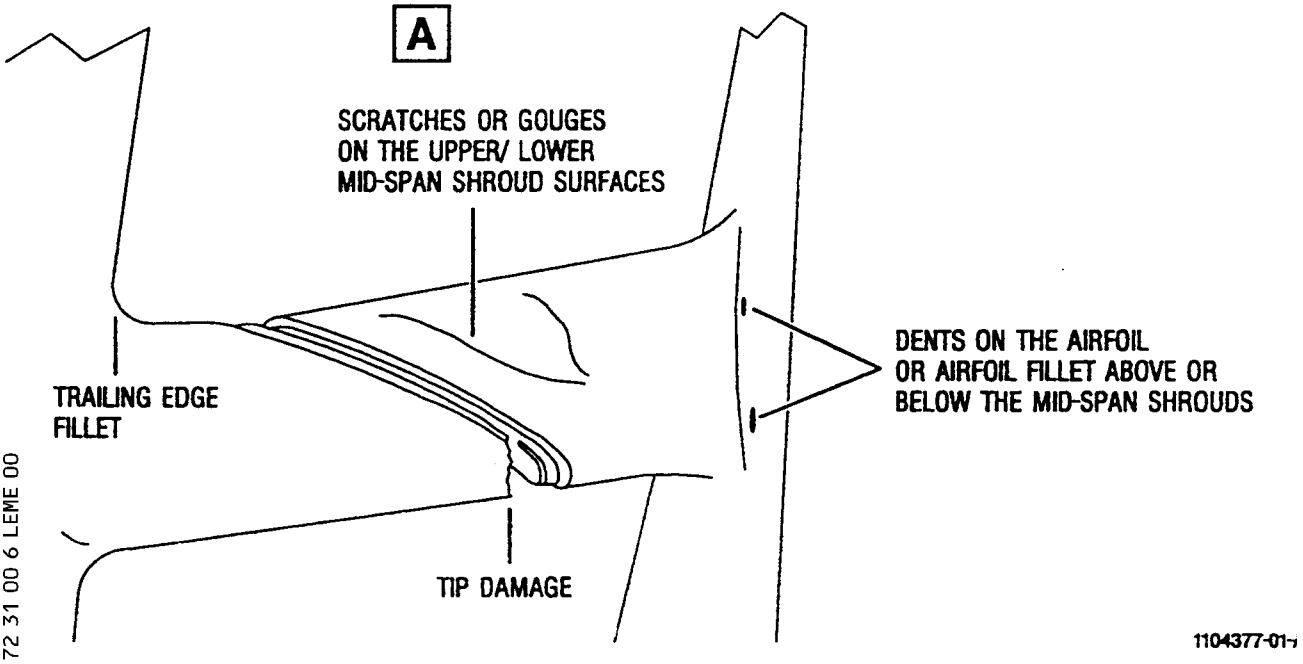


BM5 72 31 00 6 LAMO 02

HPC 1st-Stage Blades - Tip Clang
Figure 601

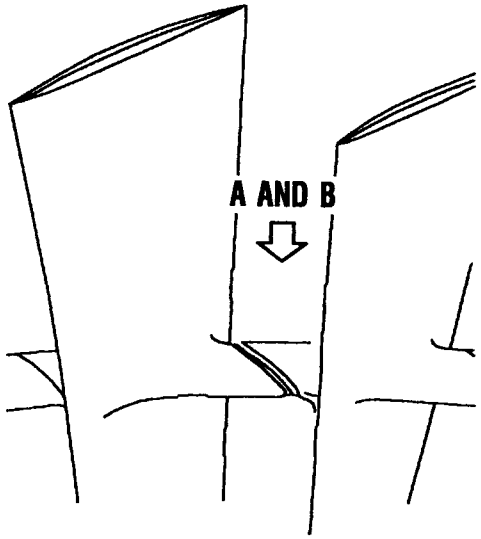


BORESCOPE VIEW LOOKING DOWN ON TOP
OF THE MID-SPAN SHROUD FROM PORT B1-1

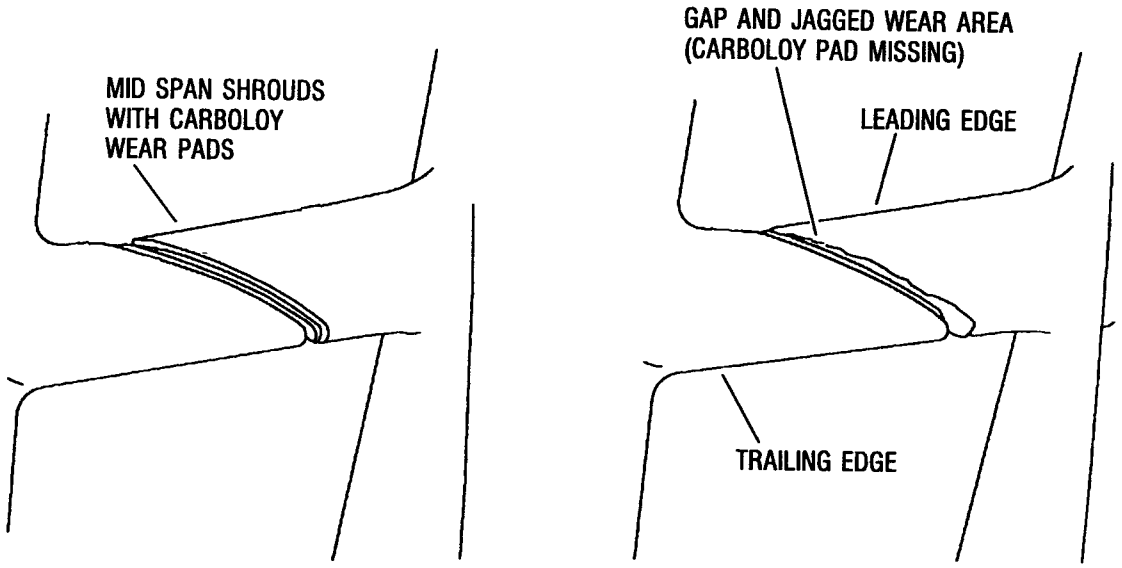


BM5 72 31 00 6 LEME 00

HPC 1st-Stage Blades - Types of Damage
(Sheet 1/3)
Figure 602



BORESCOPE VIEW LOOKING DOWN
ON TOP OF MID SPAN
SHROUD FROM PORT B1-1
(WITH CARBOLOY WEAR PADS)

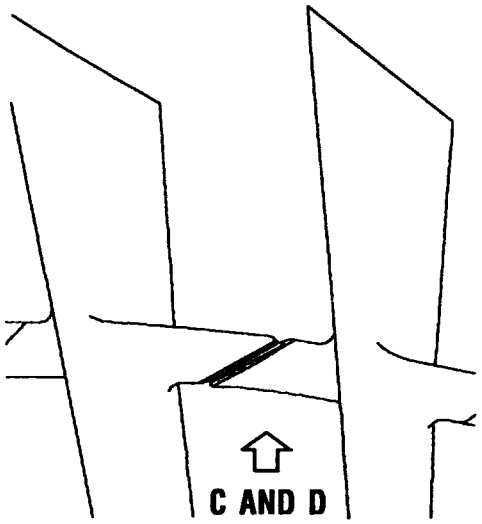


NO WEAR
A

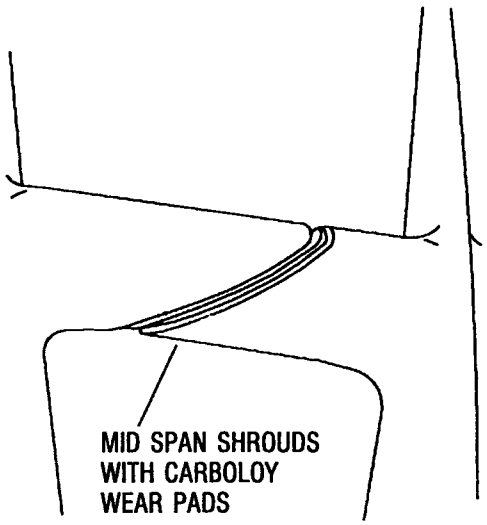
UNSERVICEABLE WEAR
B

BM5 72 31 00 6 LEMA 00

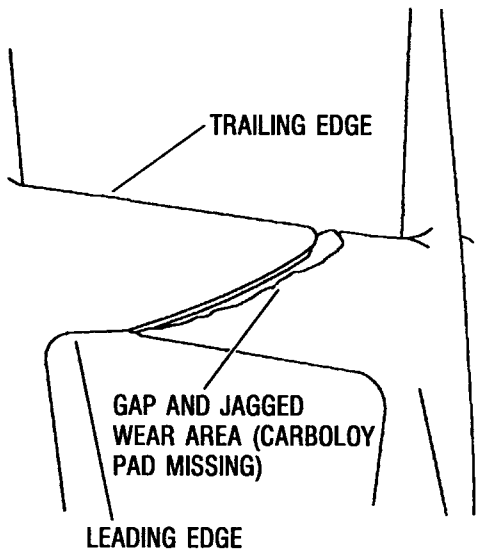
HPC 1st-Stage Blades - Types of Damage
(Sheet 2/3)
Figure 602



BORESCOPE VIEW FROM B1-1
LOOKING UP UNDER MID SPAN SHROUD TIPS
(WITH CARBOLOY WEAR PADS)



NO WEAR
C

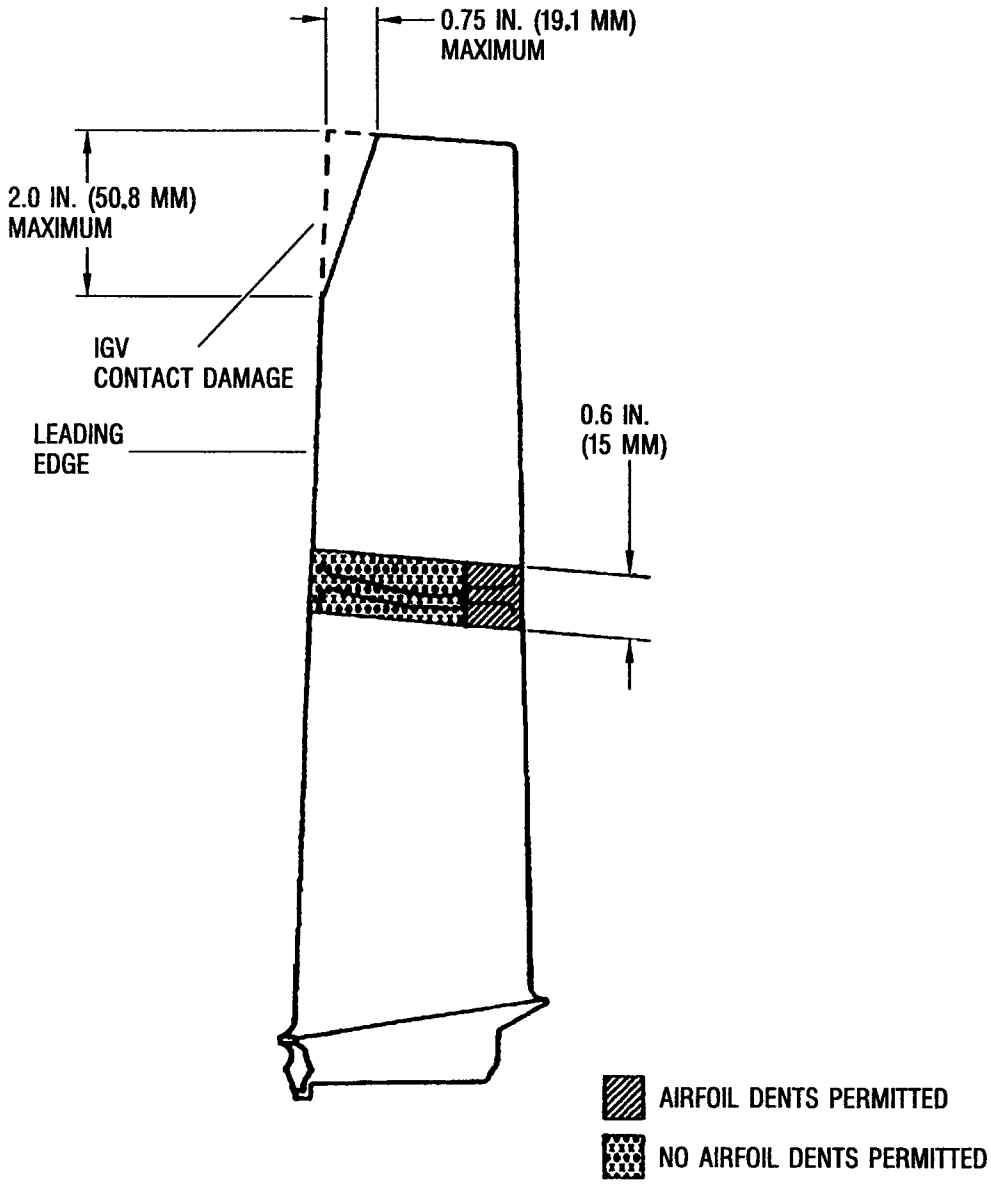


UNSERVICEABLE WEAR
D

1132838-00-A

BM5 72 31 00 6 LEMC 00

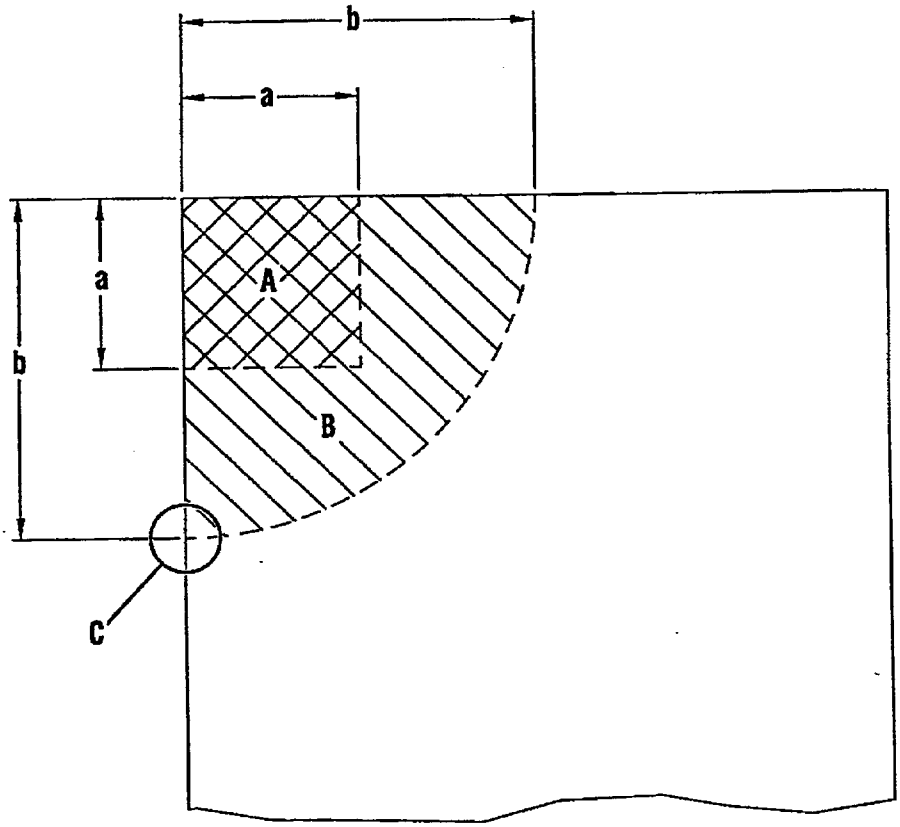
HPC 1st-Stage Blades - Types of Damage
(Sheet 3/3)
Figure 602



BM5 72 31 00 6 LCM0 02

1104378-03-A

HPC 1st-Stage Blades/IGV Contact Damage and
Airfoil Dent Location - Limits
Figure 603



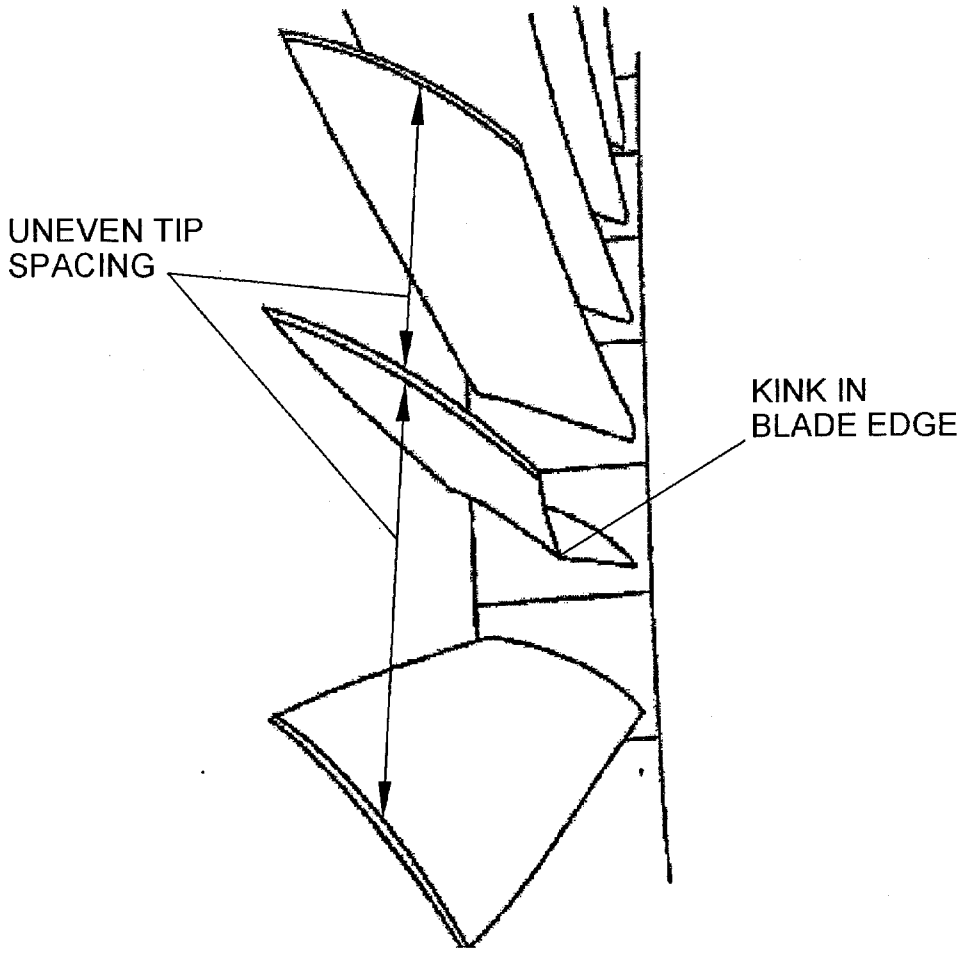
NOTE:

1. MATERIAL MISSING FROM THE BLADE TIP CORNER WITH A SEPARATION LINE RUNNING FROM THE BLADE TIP TO THE LEADING OR TRAILING EDGE
2. MISSING CORNER MAY BE ANY SHAPE WITHIN AREA A WHERE DIMENSION A IS EQUAL TO 1/4 THE BLADE CORD LENGTH.
3. MISSING CORNER MAY EXTEND INTO AREA B PROVIDED THE SEPARATION LINE IS A SMOOTH CURVE (NO NOTCHES OR CUSPS) EXCEPT AT THE LEADING OR TRAILING EDGE, LOCATION C, WHERE A TENSILE CUSP IS PERMITTED.

1218002-00-A

BM5 72 31 00 6 LGM0 00

HPC Blade Tip Corner
Figure 604



1236756-00

BM5 72 31 00 6 LJMO 00

HPC Stages 1-9 Bent Blade Kinks
and Uneven Tip Spacing
Figure 605

COMPRESSOR ROTOR - APPROVED REPAIRS

1. General

A. This procedure is used to repair the nicks on the HPC stage 1 blades (Paragraph 2) and to unshingle the HPC stage 1 blades (Paragraph 3).

B. Do a mid-span shroud inspection of the HPC Stage 1 blades after unshingling.
(1)Inspect stage 1 HPC blade mid-span shrouds at 25 cycles.
(2)Inspect stage 1 HPC blade mid-span shrouds at 200 cycles.

2. Repair of the Nicks on the HPC Stage 1 Blades, on Wing

A. Equipment and Materials

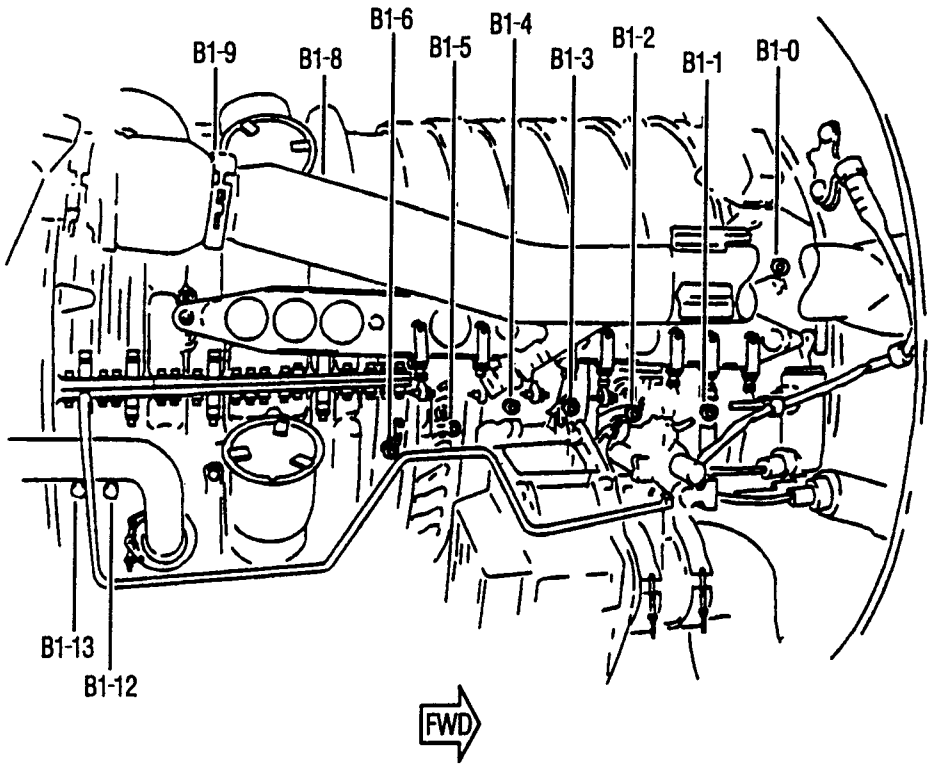
ITEM	DESIGNATION
(1)	Protective mat-Rubber Manufacturer's Association, Grade 5C43, neoprene sponge, 1 in. (25 m) thick, approximately 3X4 ft. (0.9 x 1.22 m) with warning streamer attached
(2)	Circuit Breaker Safety Clips
(3)	Access Platforms
(4)	Abrasive Cloth
(5)	Abrasive Stone
(6)Material No.C01-006	Adhesives, Plastics, Sealants (Ref. 70-00-00)
(7)Material No.C02-006	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
(8)Material No.C04-001	Cleaning Compounds and Solvents (Ref. 70-00-00)
Referenced Procedures	
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors
- 72-00-00, P. Block 601	Engine - General
- 72-00-00, P. Block 701	Engine - General

B. Job Set-Up
(1)Open, safety and tag the circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Install the access platform.

C. Repair the nicks of the HPC stage 1 blades as follows:
(1)Install the N2 rotor manual or pneumatic cranking system (Ref. 71-00-00, P. Block 501).
(2)Remove the B1-0 borescope plug (Ref. Fig. 801).
(3)Remove the number one acoustic liner that is just above the 3 o'clock position (aft looking forward) (Ref. Fig. 802).
(a)Cut the adhesive that is around the acoustical liner section. Use a

razor blade or a sharp knife.
(b)Loosen the retainer screws that hold the liner section to the fan case.
(c)Disengage the liner section from the fan case rails.
WARNING : DO NOT GET METHYL-ETHYL-KETONE (MEK) IN YOUR MOUTH OR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM MEK. PUT ON A PROTECTIVE SPLASH GOGGLE AND GLOVES WHEN YOU USE MEK. KEEP MEK AWAY FROM SPARKS, FLAMES, AND HEAT. MEK IS A POISONOUS AND FLAMMABLE SOLVENT WHICH CAN CAUSE INJURY OR DAMAGE.
(d)Remove the adhesive with MEK that remains as necessary.
(4)Remove the number three VBV door as follows:
(a)Remove the clevis bolt (4), two washers (11), and nut (10) that attaches the plain rod-end bearing (17) to the variable bypass valve (1) (Ref. Fig. 803).
NOTE : Do not remove the lockwire or adjust the jam nut on the bearing rod end.
(b)Remove the bolt (15) that attaches the bypass valve bellcrank (18) to the unison ring (16).
(c)Remove two bolts (13), two washers (12) and two nuts (14) that attach the VBV hinge (9) assembly to the fan frame (Ref. Fig. 803).
(d)Remove the variable bypass valve (1) and hinge assembly from the fan frame.
(5)Put the VSV system to the full open position.
(6)Repair the stage 1 HPC blades as follows: (Ref. Fig. 804)
(a)Find the location of the stage one blade that has the nicked leading edge. Use a borescope to visually identify the nicked blade through the B1-0 port.
(b)To turn the N2 rotor, use the manual or pneumatic crank procedure (Ref. 71-00-00, P. Block 501).
(c)When the nicked blade is located, lock the N2 rotor in position.
NOTE : Use your hand through the VBV door opening to adjust the location of the nicked blade before you lock the N2 rotor.
(d)Remove the nick from the blade leading edge in the longitudinal direction only (parallel with the length of the blade). Use a fine abrasive cloth or an abrasive stone to make the blend surface smooth.
NOTE : The surface finish after the repair must be equivalent to the original contour.
NOTE : The length of a smooth area can not be more than 16 times the depth of the damage.
NOTE : If two or more smoothed areas overlap, remove the high metal at the overlap to prevent a stress concentration.
NOTE : The leading and trailing edge radius of the nick repair area must be equivalent to the original contour.
(7)Examine the repair area for cracks. No cracks are permitted.

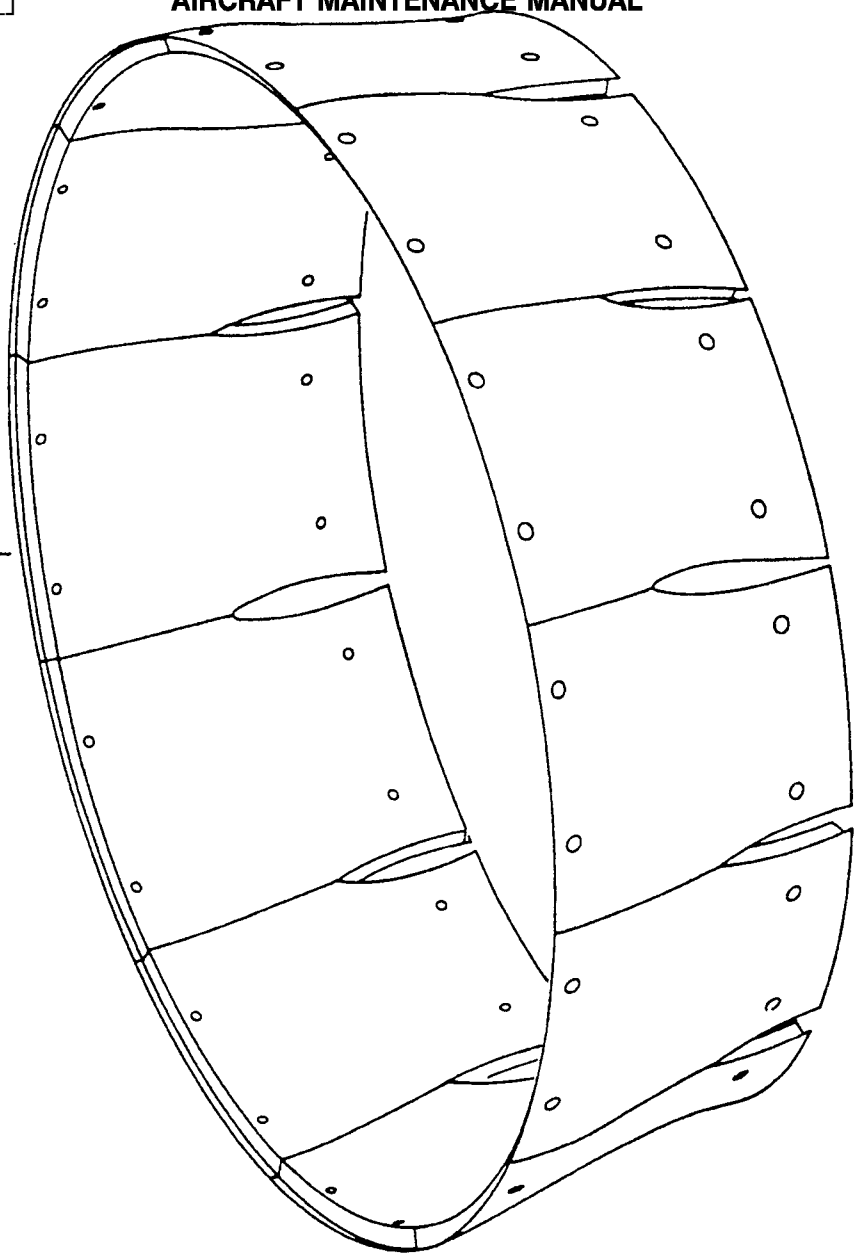
D. Install the number three VBV door as follows:
(1)Put the variable bypass valve (1) and VBV hinge (9) assembly on the fan frame bypass port (Ref. Fig. 803).
(2)Install the variable bypass valve (1) and VBV hinge (9) assembly with two bolts (13), two washers (12), and two nuts (14). Put the bolt head aft and put a washer under the bolt head.
(3)TORQUE the nuts (14) to between 80 and 90 lbf.in. (0.90 and 1.0 m.daN).



1108451-00-A

BM5 72 31 00 8 LAMO - 00

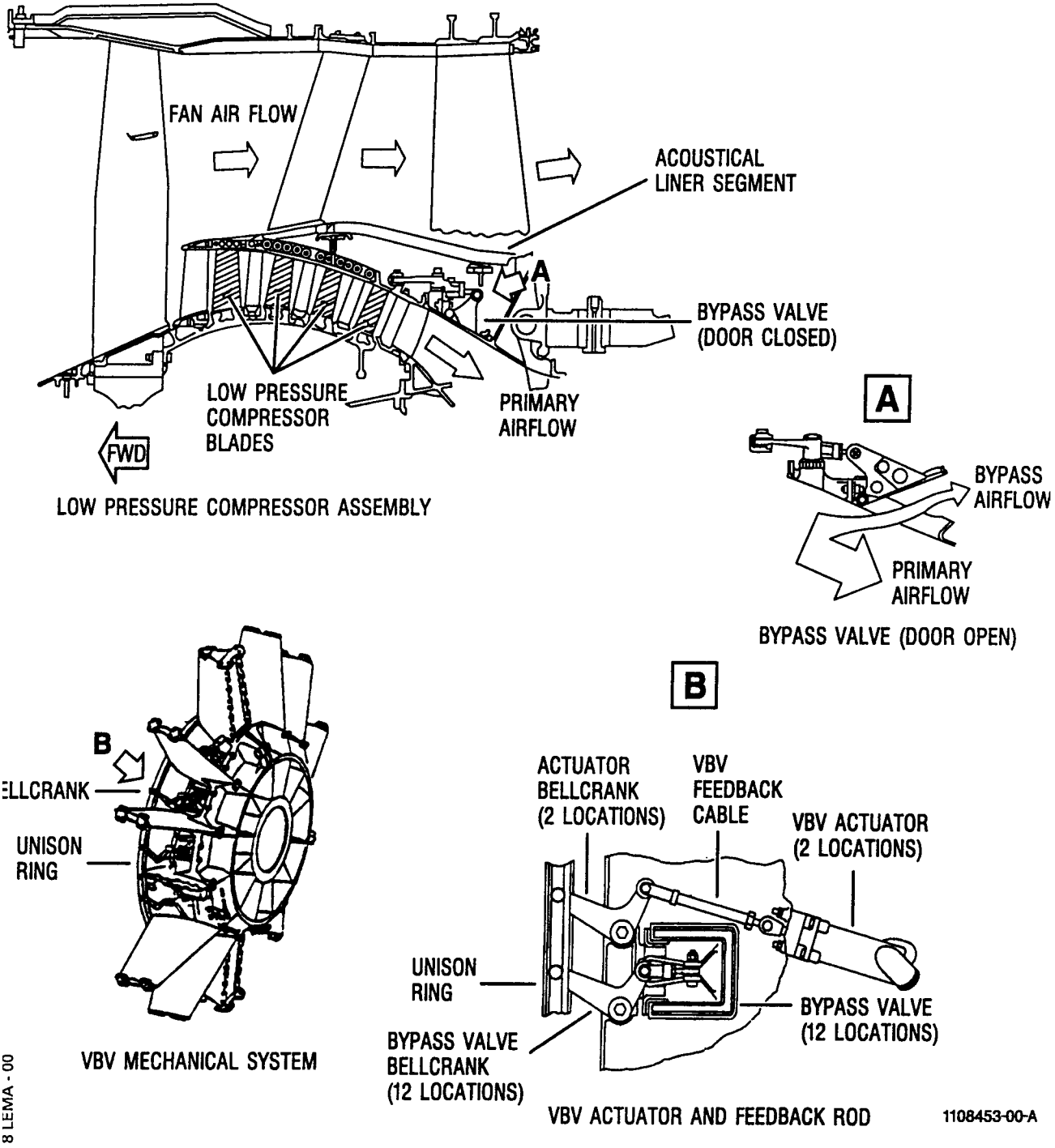
B1-0 Borescope Plug - Removal/Installation
Figure 801



1108452-00-A

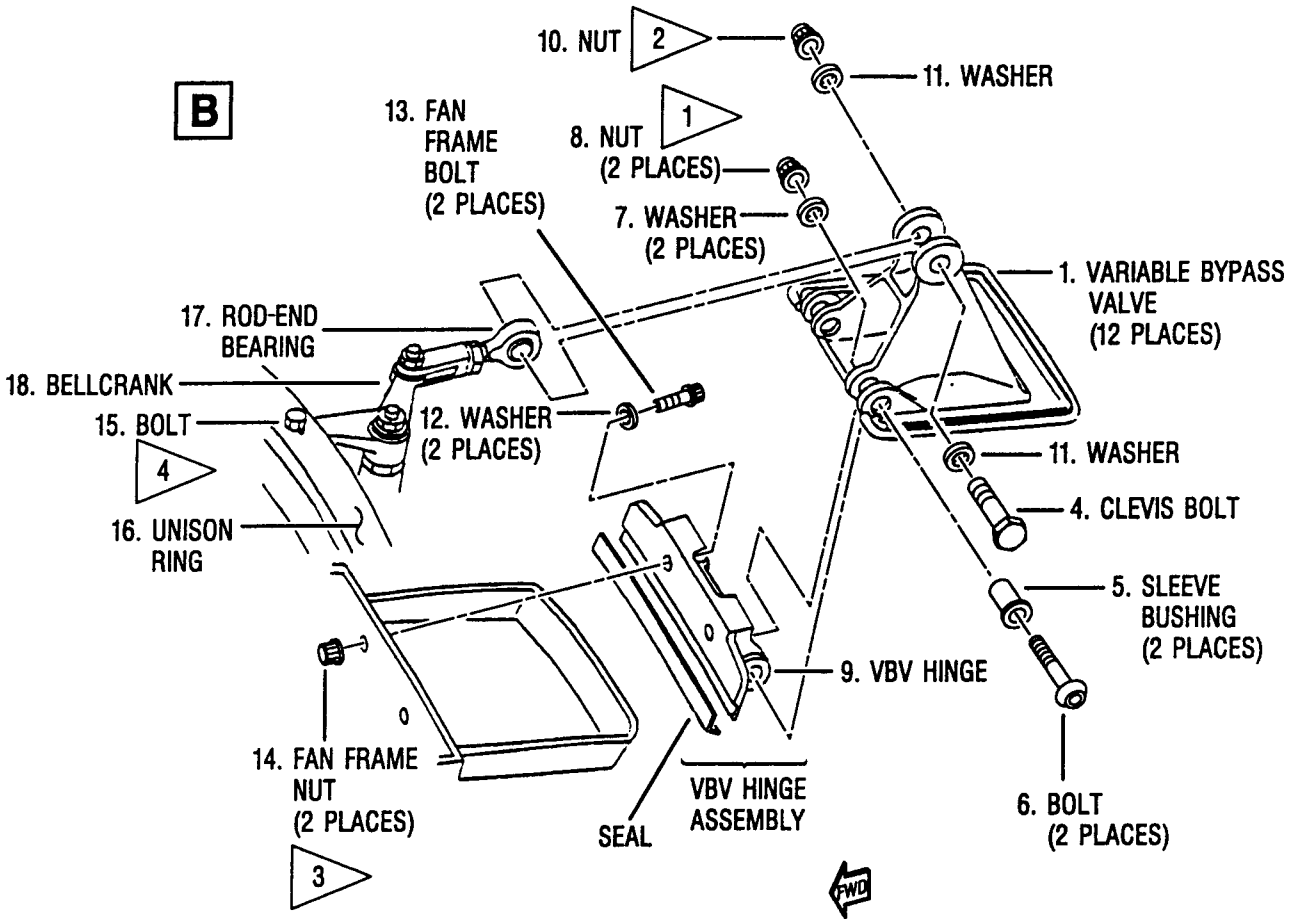
BM5 72 31 00 8 LCMO - 00

Number One Acoustic Liner - Removal/Installation
Figure 802



BM5 72 31 00 8 LEMA - 00

VBV System Details (Sheet 1/2)
Figure 803



1 TIGHTEN NUT TO 33-37 POUND-INCHES (3.7-4.2 NEWTON-METERS)

2 TIGHTEN NUT TO 55-70 POUND-INCHES (6.2-7.9 NEWTON-METERS)

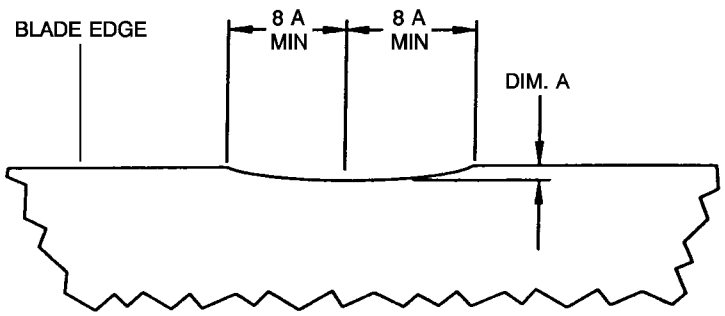
3 TIGHTEN NUT TO 80-90 POUND-INCHES (9.0-10.2 NEWTON-METERS)

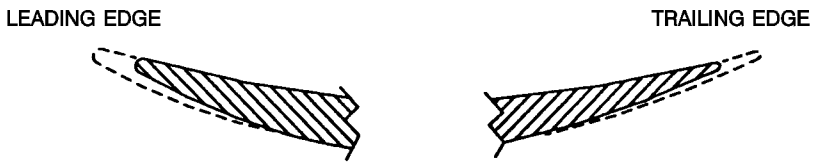
4 TIGHTEN BOLT TO 190-230 POUND-INCHES (21.5-26.6 NEWTON-METERS)

1108454-00-A

BM5 72 31 00 8 LEMJ - 00

VBV - Removal/Installation (Sheet 2/2)
Figure 803





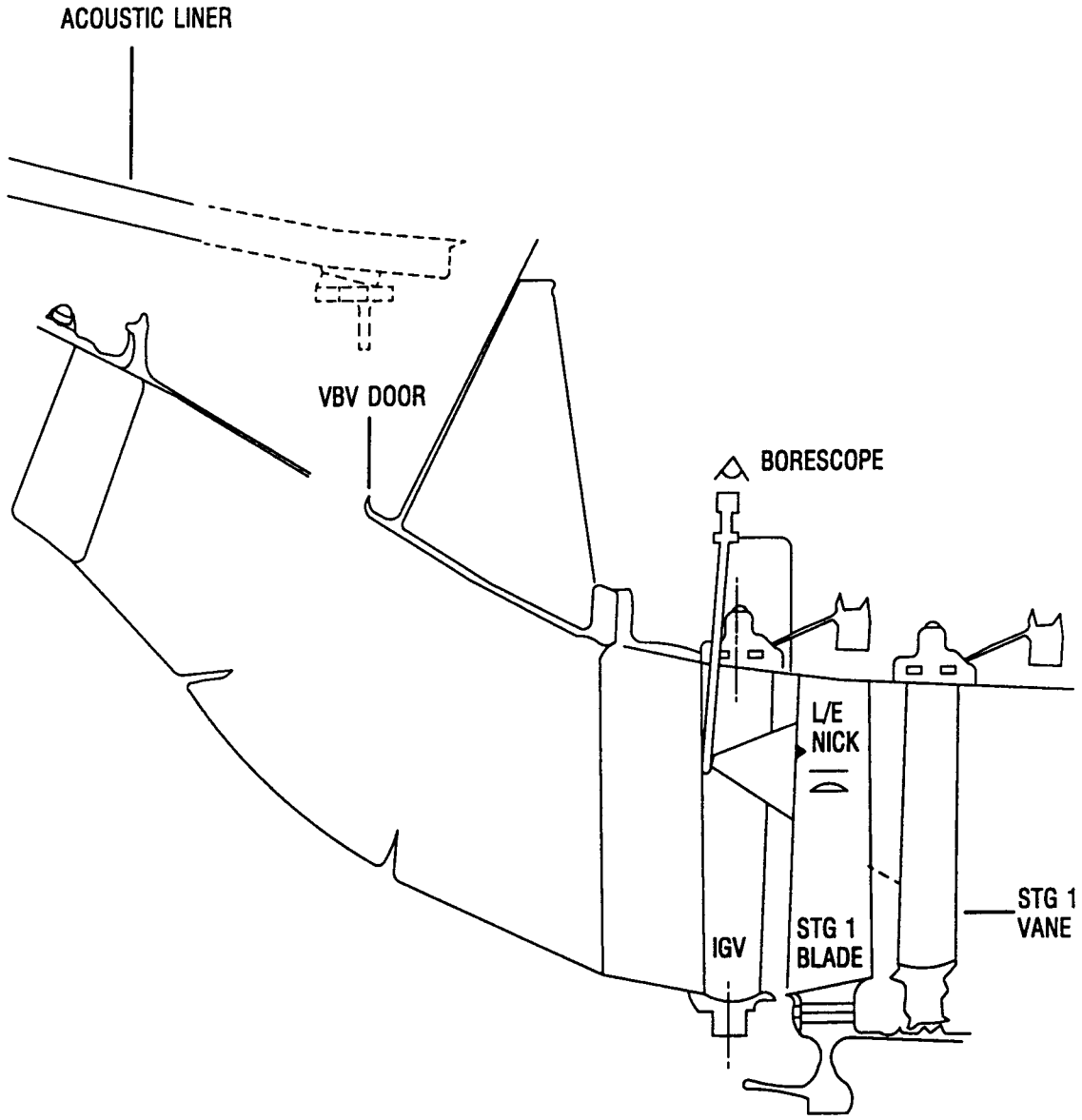
NOTES: REWORK CONTOUR MUST CONFORM TO ORIGINAL CONTOUR AS SHOWN.

TRAILING EDGE THICKNESS AFTER BLENDING MUST NOT BE LESS THAN ORIGINAL THICKNESS.

MAXIMUM DIM. A TO BE 0.1 in. (2.5 mm) OR 5% OF THE BLADE CHORD LENGTH.

BM5 72 31 00 8 LGMA 02

Leading and Trailing Edge Blending (Sheet 1/2)
Figure 804



BM5 72 31 00 8 LGMJ - 00

Blending of Stage 1 Blades with Leading Edge Nicks (Sheet 2/2)
Figure 804

(4)Attach the bypass valve bellcrank (18) to the unison ring (16) with bolt (15).
(5)TORQUE the bolt (15) to between 190 and 230 lbf.in. (2.15 and 2.60 m.daN).
(6)Assemble the bypass valve bellcrank (18) with the plain rod-end bearing (17) to the variable bypass valve (1).
(7)Use a spray gun to put a thin coat of release agent compound on the part of the variable bypass valve (1) that touches the fan frame.

CAUTION : DO NOT PERMIT THE BEARING TO MOVE WHEN YOU INSTALL THE BOLT. IF YOU PERMIT THE BEARING TO MOVE, THE BLEED VALVE CAN BECOME OUT OF ADJUSTMENT.

(8)Attach the plain rod-end bearing (17) to the variable bypass valve (1) door with bolt (4), two washers (11), and nut (10).
(9)TORQUE the nut (10) to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN).

E. Install the number one Acoustic Liner that is just above the 3 o'clock position aft looking forward (Ref. Fig. 802).
(1)Make sure all the mating surfaces are clean and without deterioration.
(2)Apply a thin layer of lubricant to the retainer screw threads.

CAUTION : DO NOT USE A HAMMER OR MALLET TO PUT THE ACOUSTICAL LINER SECTIONS IN POSITION. THE ACOUSTICAL LINER SECTIONS ARE EASILY DAMAGED.

(3)Put the acoustical liner in position, and engage the acoustical liner in the fan case.
(a)TORQUE the retainer screws to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN).
(4)Apply a black silicone adhesive to the areas around the acoustical liner.
(a)Make sure the adhesive is at the same level as the adjacent surfaces.

F. Install the B1-0 borescope plug.
(1)Apply a light layer of antiseize compound on the threads and the pressure faces of the plugs (Ref. Fig. 801).
(2)Install the borescope plug into the borescope port.
(3)TORQUE the plug to between 40 and 60 lbf.in. (0.45 and 0.68 m.daN).
(4)Install the lockwire.

G. Close the variable stator vanes (VSV).

H. Close-Up
(1)Make sure that the work area is clean and clear of tools and miscellaneous items of equipment.
(2)Remove the access platform.

WARNING : OBEY THE INSTRUCTIONS IN 71-13-00, P. BLOCK 301 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO THE EQUIPMENT CAN OCCUR.

(3)Close the fan cowl panels.
(4)Close the thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).
(5)Remove the safety clips and tags and close the circuit breakers.

3. Unshingle the HPC Stage 1 Blades, on Wing

A. Equipment and Materials

ITEM	DESIGNATION
(1)	Protective Mat-Rubber Manufacturer's Association, Grade 5C43, neoprene sponge, 1 in. (25 mm) thick, approximately 3 x 4 ft. (0.9 x 1.22 m) with warning streamer attached
(2)	Circuit Breaker Safety Clips
(3)	Access Platforms
(4)	Wooden or Plastic Dowel, 1 in. (25 mm) diameter or larger
(5)	Torque Wrench 67 lbf.in. (0.76 m.daN)
(6)	Torque Wrench 200 lbf.in. (2.94 m.daN)
(7)	Torque Wrench 100 lbf.in. (1.13 m.daN)
(8)	Torque Wrench 90 lbf.in. (1.02 m.daN)
(9)Material No.C01-006	Adhesives, Plastics, Sealants (Ref. 70-00-00)
10)Material No.C02-006	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
11)Material No.C04-001	Cleaning Compounds and Solvents (Ref. 70-00-00)
or Material No.C04-160	Cleaning Compounds and Solvents (Ref. 70-00-00)
Referenced Procedures	
- 71-00-00, P. Block 401	Power Plant - General
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors
- 73-21-01, P. Block 501	Main Engine Control

B. Job Set-Up
(1)Open, safety and tag the circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Install the access platform.

C. Unshingle the HPC Stage 1 Blades as follows:
(1)Install the N2 rotor manual or pneumatic cranking system (Ref. 71-00-00, P. Block 501).
(2)Remove the B1-0 boroscope plug (Ref. Fig. 801).
(3)Remove the number one acoustic liner that is just above the 3 o'clock position (aft looking forward) (Ref. Fig. 802).
(a)Cut the adhesive that is around the acoustical liner section. Use a razor blade or a sharp knife.
(b)Loosen the retainer screws that hold the liner section to the fan case.
(c)Disengage the liner section from the fan case rails.
WARNING : DO NOT GET METHYL-ETHYL-KEYTONE (MEK) IN YOUR MOUTH OR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM MEK. PUT ON A

PROTECTIVE SPLASH GOGGLE AND GLOVES WHEN YOU USE MEK. KEEP MEK AWAY FROM SPARKS, FLAMES, AND HEAT. MEK IS A POISONOUS AND FLAMMABLE SOLVENT WHICH CAN CAUSE INJURY OR DAMAGE.

(d)Remove the adhesive with Material No.C04-001 that remains as necessary.

(4)Remove the number three VBV door as follows :

(a)Remove the clevis bolt (4), two washers (11), and nut (10) that attaches the plain rod-end bearing (17) to the variable bypass valve (1) (Ref. Fig. 803).

NOTE : Do not remove the lockwire or adjust the jam nut on the bearing rod-end.

(b)Remove the bolt (15) that attaches the bypass valve bellcrank (18) to the unison ring (16).

(c)Remove two bolts (13), two washers (12) and two nuts (14) that attach the VBV hinge (9) assembly to the fan frame (Ref. Fig. 803).

(d)Remove the variable bypass valve (1) and VBV hinge (9) assembly from the fan frame.

(5)Put the VSV system to the full open position.

(6)Find the location of the stage one blade that has the shingled HPC stage 1 blades. Use a boroscope to visually identify the shingled blade through the B1-0 port.

(7)Repair the blade(s) showing signs of shingling as follows:

(a)Rotate the core using the N2 rotor manual or pneumatic cranck (Ref. 71-00-00, P. Block 501) to unshingle stage 1 HPC blades as required.

(b)Use a one in. (25 mm) diameter or larger wooden or plastic dowel and insert through the VBV door to move the shingled stage 1 HPC blades apart.

(8)Examine the stage 1 HPC blades for bent mid-span shrouds as follows:

(a)Looking aft through the VBV door, observe the radial alignment of the adjacent stage 1 HPC blade mid-span shrouds. If the misalignment is noticeably greater than adjacent shrouds, replace the engine. (Ref. 71-00-00, P. Block 401).

D. Install the number three variable bypass valve door as follows :

(1)Put the VBV (1) and VBV hinge (9) assembly on fan frame bypass port (Ref. Fig. 803).

(2)Install the variable bypass valve (1) and VBV hinge (9) assembly with two bolts (13), two washers (12), and two nuts (14). Put the bolt head aft and put a washer under the bolt head.

(3)TORQUE the nuts (14) to between 80 and 90 lbf.in. (0.90 and 1.0 m.daN).

(4)Attach the bypass valve bellcrank (18) to the unison ring (16) with bolt (15).

(5)TORQUE the bolt (15) to between 190 and 230 lbf.in. (2.15 and 2.60 m.daN).

(6)Assemble the bypass valve bellcrank (18) with the plain rod-end bearing (17) to the variable bypass valve (1).

(7)Use a spray gun to put a thin coat of Material No.C04-001 on part of the valve (1) that touches the fan frame.

CAUTION : DO NOT PERMIT THE BEARING TO MOVE WHEN YOU INSTALL THE BOLT. IF YOU PERMIT THE BEARING TO MOVE, THE BLEED VALVE CAN BECOME OUT OF ADJUSTMENT.

(8)Attach the plain rod-end bearing (17) to the variable bypass valve (1) door with bolt (4), two washers (11), and nut (10).
(9)TORQUE the nut (10) to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN).

E. Install the number one Acoustic Liner that is just above the 3 o'clock position (aft looking forward) (Ref. Fig. 802).
(1)Make sure all the mating surfaces are clean and without deterioration.
(2)Apply a thin layer of Material No.C02-006 to the retainer screw threads.
CAUTION : DO NOT USE A HAMMER OR MALLET TO PUT THE ACOUSTICAL LINER SECTIONS IN POSITION. THE ACOUSTICAL LINER SECTIONS ARE EASILY DAMAGED.
(3)Put the acoustical liner in position, and engage the acoustical liner in the fan case.
(a)TORQUE the retainer screws to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN).
(4)Apply Material No.C01-006 to the areas around the acoustical liner.
(a)Make sure the adhesive is at the same level as the adjacent surfaces.

F. Install the B1-0 boroscope plug.
(1)Apply a light layer of Material No.C02-006 on the threads and the pressure faces of the plugs (Ref. Fig. 801).
(2)Install the B1-0 boroscope plug into the boroscope port.
(3)TORQUE the plug to between 40 and 60 lbf.in. (0.45 and 0.68 m.daN).
(4)Install the lockwire.

G. Remove the N2 rotor manual or pneumatic crank procedure (Ref. 71-00-00, P. Block 501).

H. Adjust the VSV system to the fully closed position (Ref. 73-21-01, P. Block 501).

I. Close-Up
(1)Make sure the work area is clean and clear of tools and miscellaneous items of equipment.
(2)Remove the access platform.
WARNING : OBEY THE INSTRUCTIONS IN 71-13-00, P. BLOCK 301 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO THE EQUIPMENT CAN OCCUR.
(3)Close the thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).
(4)Remove the safety clips and tags and close the circuit breakers.

4. Blend Repair of HPC Rotor Blades

A. General
(1)This section contains the procedure for the borescope blend repair of the Stage 1-14 HPC rotor blades and the criteria which must be met before attempting the repair.
(2)The purpose of this procedure is to repair the HPC rotor blades found unserviceable during the borescope inspection. Using this procedure,

unserviceable damage can be blended out with the engine installed on the aircraft.

(3)When using this procedure, the operator is permitted to refer to different HPC blade damage repairable limits and the damage will be removed during the blend repair procedure.

B. Equipment and Materials

ITEM	DESIGNATION
(1)	HPC Blade Borescope Blending Tool (MSE 79)
(2)	Micro CCD Video Camera and Monitor - Wolf Compatible
(3)	High Intensity Borescope Light Projector
(4)	Borescope Fiber Light Cable
NOTE : Equivalent substitutes to equipment listed above are not permitted.	
(5)	Circuit Breaker Safety Clips
(6)	Access Platforms
Referenced Procedures	
- 71-00-00, P. Block 501	General
- 71-13-00, P. Block 301	Cowl Doors
- 72-00-00, P. Block 601	General

C. Blend Repair of HPC Rotor Blades

(1)Job set-up

(a)Open, safety and tag the circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

(b)Install the access platform.

(2)Blending limits

NOTE : These limits are used to keep the rotor in balance and keep the stall margins to a maximum.

(a)Stages 1-14 HPC blades

1 Blending of nicks, dents, and tears are permitted within limits
R (Ref. Fig. 805) (Stage 1),
R in (Ref. Fig. 806),
R or in (Ref. Fig. 807) (Stage 2-14).

R 2 Do not blend less than 0.25 in. (6.4 mm) from the platform root fillet
R radii.
R (Ref. Fig. 805),
R (Ref. Fig. 806) (Sheets 1 and 2),
R (Ref. Fig. 807) (Sheets 1 and 2).

3 Tool marks on the blade airfoil surfaces and stator airfoil surfaces or stator case lands from blending are permitted.

R (b)Stage 1 and Stage 2 HPC blades only :
R (Ref. Fig. 805, 806, 807).
R NOTE : Any amount of edge erosion is permitted (limited by low engine
R performance and/or high vibration).
R 1 You can blend no more than four blades per stage up to 100 percent of
R Area B (only one tip corner per blade) and/or 100 percent of Area C.
R 2 You can blend any number of blades up to 100 percent of Area A (only

one tip corner per blade and/or up to 50 percent of Area C.

3 Not more than six blades can be blended for tip corner damage within the defined limits (Ref. Fig. 806) provided the material removed from each blade outside the tip corner area does not exceed 0.2 square inches, and only one tip corner per blade may be blended to this limit.

(c)Stage 3-14 HPC blades only :
(Ref. Fig. 805, 806, 807).

NOTE : Any amount of edge erosion is permitted (limited by low engine performance and/or high vibration).

1 Blending is limited to six blades per stage up to 100 percent of Area B (only one tip corner per blade) and/or up to 100 percent Area C.

2 And also, an unlimited number of blades can be blended up to 100 percent of Area A (only one tip corner per blade) and/or up to 50 percent of Area C.

(3)Procedure

(a)Measurement of the damaged area (Ref. Fig. 808, 810).

NOTE : Do not install or remove the tool tip from the drive shaft head with the drive shaft head in the zero degree position. If you remove the tool tip with the drive shaft head in the zero degree position the drive belt will disengage.

1 Position the drive shaft head (2) (Ref. Fig. 808) (Sheet 2/2) to the 90 degree position.
Install the measuring grid tip (5) (Ref. Fig. 810) on the drive shaft head (2) (Ref. Fig. 808) (Sheet 2/2).
Tighten the lock screw (6) (Ref. Fig. 810).

2 Position the measuring grid tip (5) (Ref. Fig. 810) in the zero degree position, insert tool into the borescope port.

3 Monitor the measuring grid tip (5) (Ref. Fig. 810), and position the drive shaft head (2) (Ref. Fig. 808) (Sheet 2/2) to the 90 degree position.

4 Position the measuring grid tip (5) (Ref. Fig. 810) close to the HPC blade damage area.

NOTE : Each square on the grid is 0.050 x 0.050 in. (1.3 x 1.3 mm). Overall grid size is 0.350 x 0.350 in. (8.9 x 8.9 mm).

5 Get the inspection damage report from the Engine Records for the engine you will inspect record the damage result, such as the damage size and location.

6 Compare the recorded blade damage against the allowable blend limits.

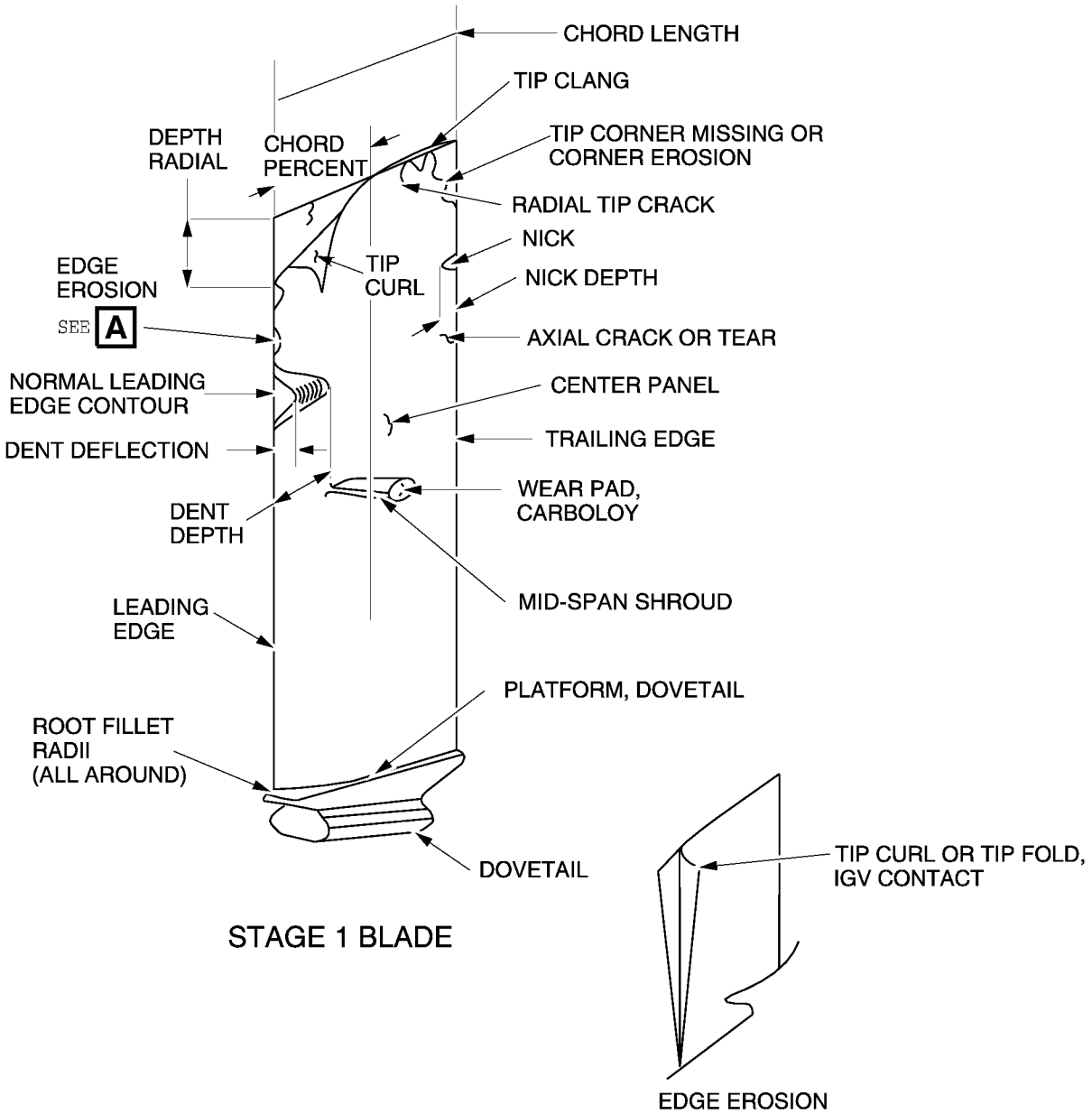
7 If the damage is less than permitted limits, find the length of the blend necessary to keep the minimum blend radius (Ref. Fig. 809).

8 Put the drive shaft head (2) (Ref. Fig. 808) (Sheet 2/2) at a zero degree position and remove the tool from the borescope port.

9 Put the drive shaft head (2) (Ref. Fig. 808) (Sheet 2/2) at a 90 degree position. Loosen the lock screw (6) (Ref. Fig. 810) and remove the measuring grid tip (5) (Ref. Fig. 810).

(b)Prepare to do blend repair as follows :

1 Put the drive shaft head (2) (Ref. Fig. 808) (Sheet 2/2) at a 90 degree position.
Install the primary blade edge grinding tip (1) (Ref. Fig. 810) onto the drive shaft head (2) (Ref. Fig. 808) (Sheet 2/2).



STAGE 1 BLADE

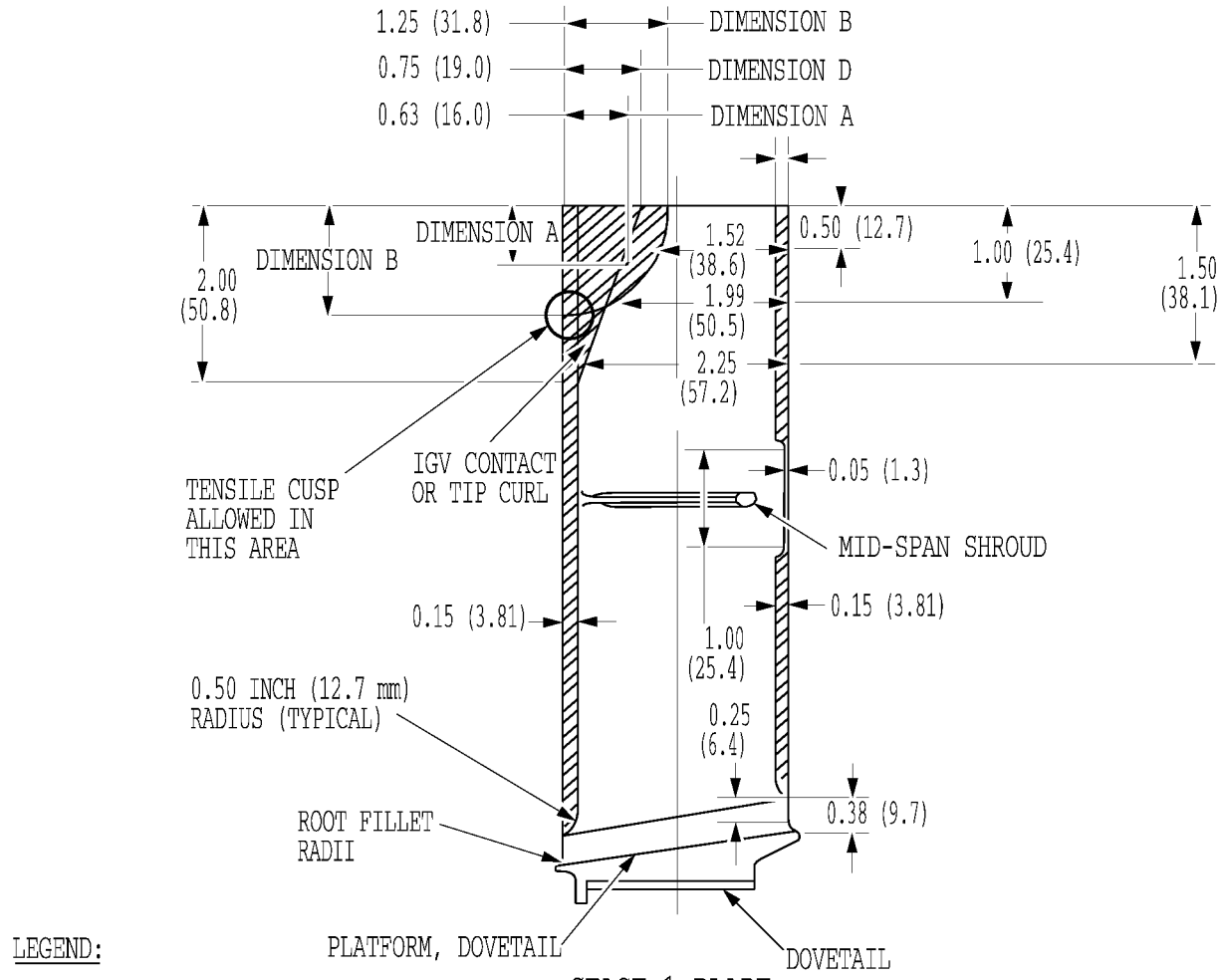
NOTE: NO SHARP CORNERS AFTER BLENDING,
MINIMUM BLEND RADII IS 0.5 INCH (12.7 mm) RADIUS

1281921-00-A

BM5 72 31 00 8 LLMA 00

HPC Blade Blend Limits (Sheet 1/2)
Figure 805

R



NOTE: NO SHARP CORNERS AFTER BLENDING,
MINIMUM BLEND RADII IS 0.5 IN (12.7 mm) RADIUS

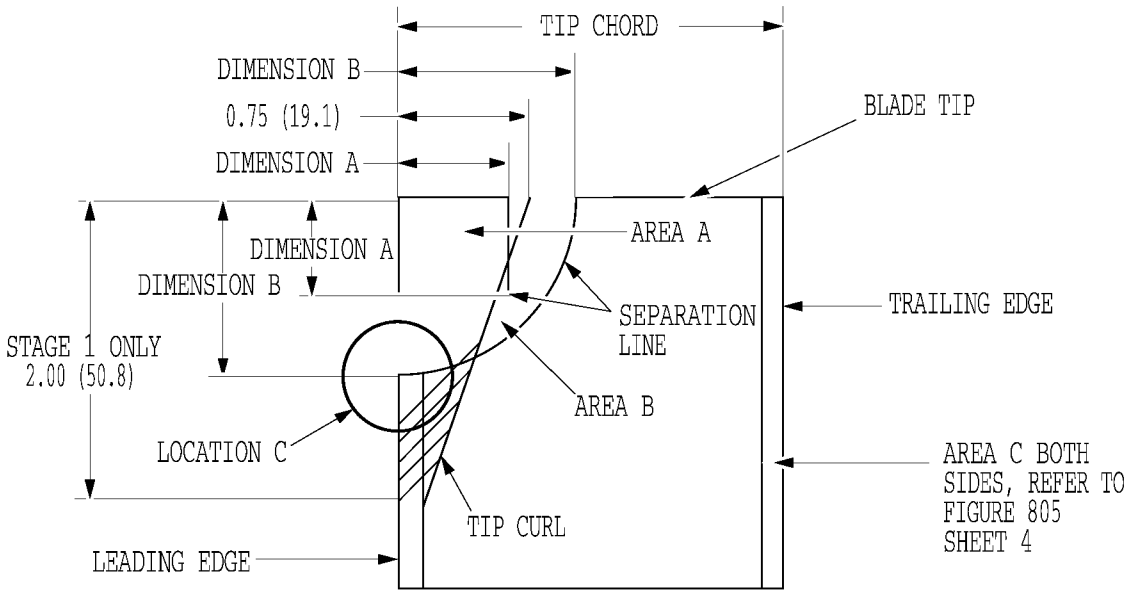
DIMENSIONS ARE IN INCHES
(MILLIMETERS ARE IN PARENTHESIS)

1257239-00-B

BM5 72 31 00 8 LLMB 00

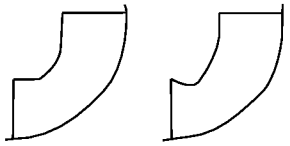
HPC Blade Blend Limits (Sheet 2/2)
Figure 805

R



REFER TO THE FOLLOWING FIGURES FOR DIMENSIONS BY STAGE

EXAMPLE OF TENSILE CUSPS FOR LOCAITON C



NOTE: 1. THE MATERIAL MISSING FROM THE BLADE TIP CORNER MUST HAVE A SEPARATION LINE THAT RUNS FROM THE BLADE TIP TO THE LEADING OR TRAILING EDGE.
2. THE MISSING CORNER MAY BE ANY SHAPE FOR AREA A WHERE THE DIMENSION A IS LESS THAN OR EQUAL TO 1/4 THE BLADE TIP CHORD LENGTH. AND, DIMENSION B IS LESS THAN 1/2 OF THE BLADE TIP CHORD LENGTH (SEE BLADE TIP CORNER FIGURES BY STAGE FOR EXACT DIMENSIONS).
3. THE MISSING CORNER MAY EXTEND INTO AREA B PROVIDED THE SEPARATION LINE IS A SMOOTH CURVE(NO NOTCHES OR CUSPS) EXCEPT AT THE LEADING OR TRAILING EDGE WHERE A TENSILE CUSP IS PERMITTED AT LOCATION C.

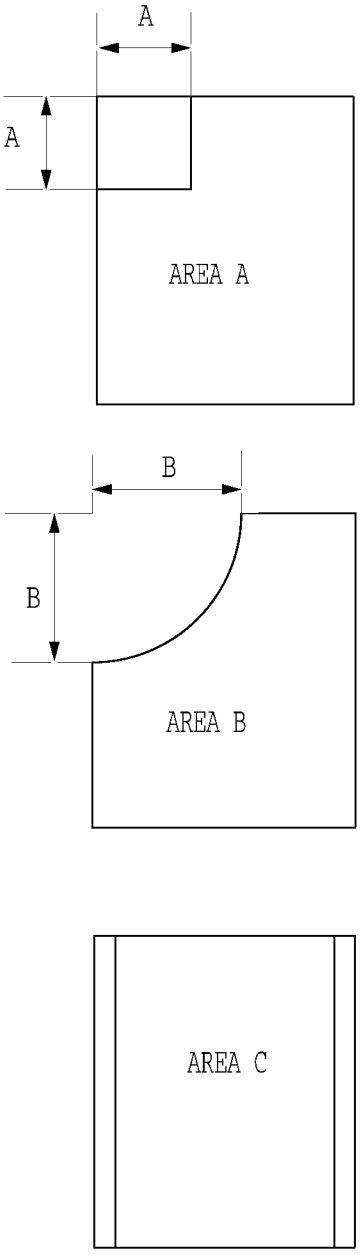
NO SHARP CORNERS AFTER BLENDING, MINIMUM BLEND RADII IS 0.5 INCH (12.7 mm) RADIUS
DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESIS).

1281925-00-B

BM5 72 31 00 8 LMMA 00

HPC Blade Tip Corner (Sheet 1/3)
Figure 806

R



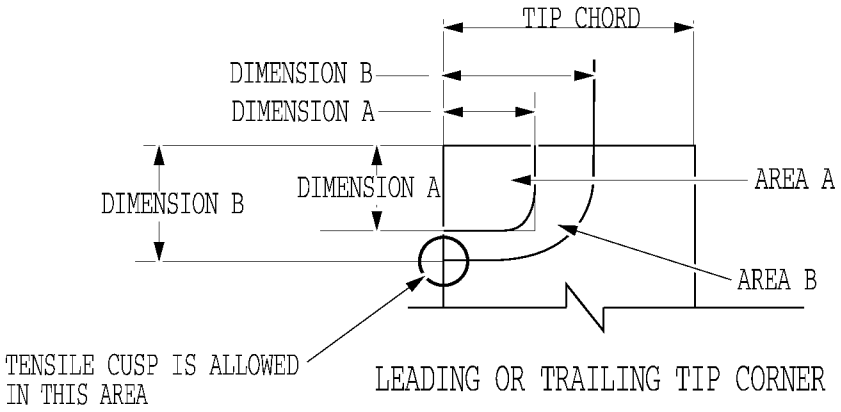
STAGE 1-14 BLADES

1281928-00-A

BM5 72 31 00 8 LMMB 00

HPC Blade Tip Corner (Sheet 2/3)
Figure 806

R



DIMENSION	INCH	(mm)	TIP CHORD %
A	0.63	(16.0)	0.25
B	1.25	(31.8)	0.5

AREA	SQ. IN.	(SQ. mm)	QTY. OF BLADES
A	0.40	(258.0)	ANY NUMBER
B	1.23	(793.5)	FOUR (4)

STAGE 1 HPC BLADE ALLOWABLE MISSING TIP CORNER

NOTE: NO SHARP CORNERS AFTER BLENDING,
MINIMUM BLEND RADII IS 0.5 INCH (12.7 mm) RADIUS

DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESIS).

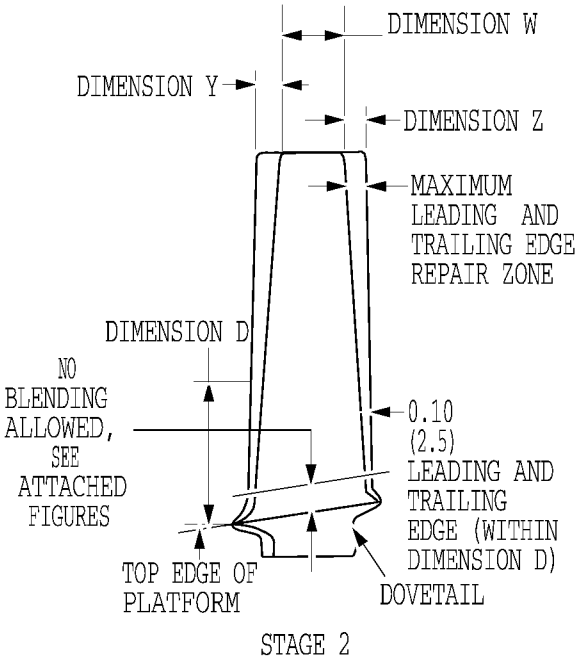
FOR STAGE 2-14 BLADES REFER TO FIGURE 807 SHEET 16

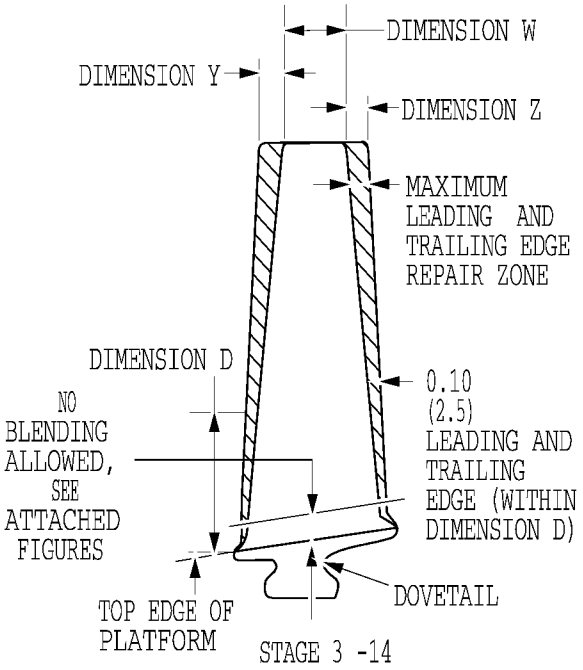
1257241-00-B

BM5 72 31 00 8 LMMC 00

HPC Blade Tip Corner (Sheet 3/3)
Figure 806

R





STAGE	DIMENSION D	TOTAL TIP CHORD BLEND= DIMENSION Y+Z	MINIMUM TIP CHORD (DIMENSION W)
2	2.23 (56.6)	0.30 (7.6)	2.44 (62.0)
3	2.00 (50.8)	0.30 (7.6)	1.65 (41.9)
4	1.75 (44.5)	0.30 (7.6)	1.51 (38.4)
5	1.50 (38.1)	0.28 (7.1)	1.43 (36.3)
6	1.25 (31.8)	0.28 (7.1)	1.30 (33.0)
7	1.00 (25.4)	0.24 (6.1)	1.21 (30.7)
8	1.00 (25.4)	0.24 (6.1)	1.13 (28.7)
9	0.75 (19.1)	0.22 (5.6)	1.10 (27.9)
10	0.75 (19.1)	0.22 (5.6)	1.11 (28.2)
11	0.75 (19.1)	0.20 (5.1)	0.97 (24.6)
12	0.50 (12.7)	0.20 (5.1)	0.92 (23.4)
13	0.50 (12.7)	0.20 (5.1)	0.97 (24.6)
14	0.33 (8.4)	0.20 (5.1)	0.97 (24.6)

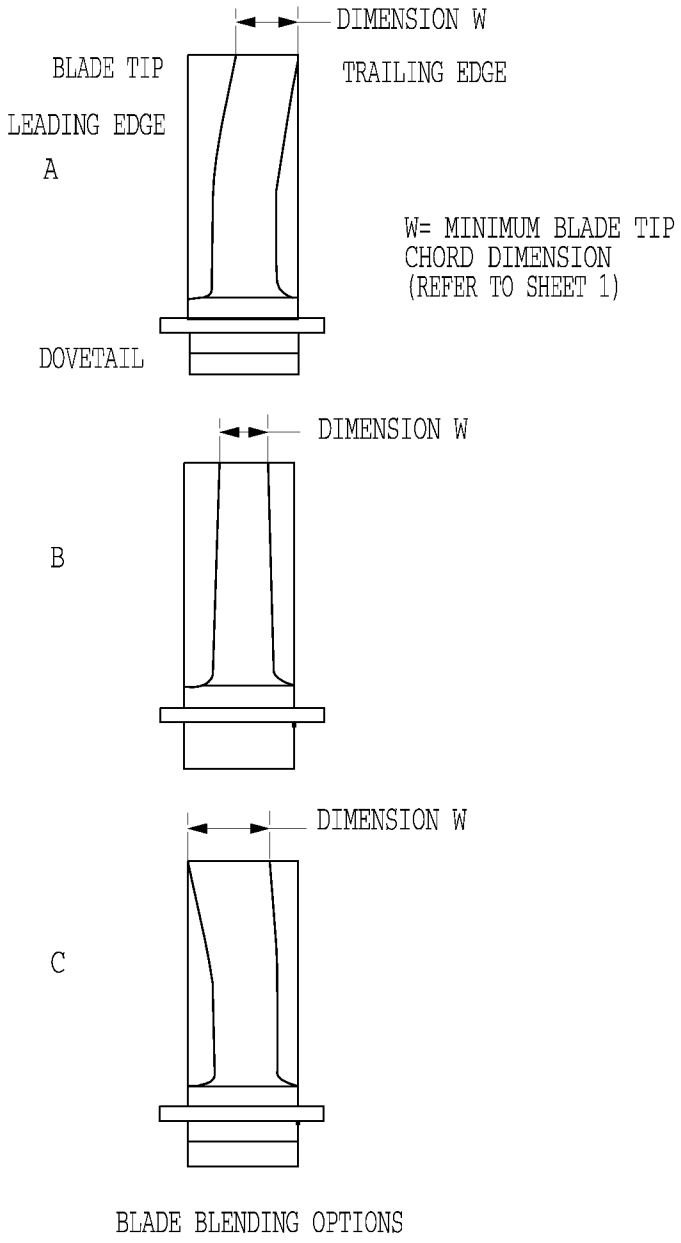
NOTE: DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESIS).
ALL BLADES MAY BE BLENDED TO 50% OF THESE LIMITS (REFER TO FIGURE 805 SHEET 2 FOR STAGE 1) AND ONLY (4) BLADES IN STAGE 1 (FIGURE 805 SHEET 2) AND STAGE 2 MAY BE BLENDED TO 100% OF THESE LIMITS, AND ONLY (6) BLADES IN STAGE 3-14 MAY BE BLENDED TO 100% OF THESE LIMITS.

1281931-00-B

BM5 72 31 00 8 LNMA 00

Stage 2-14 HPC Blade Blend Limits (Sheet 1/16)
Figure 807

R



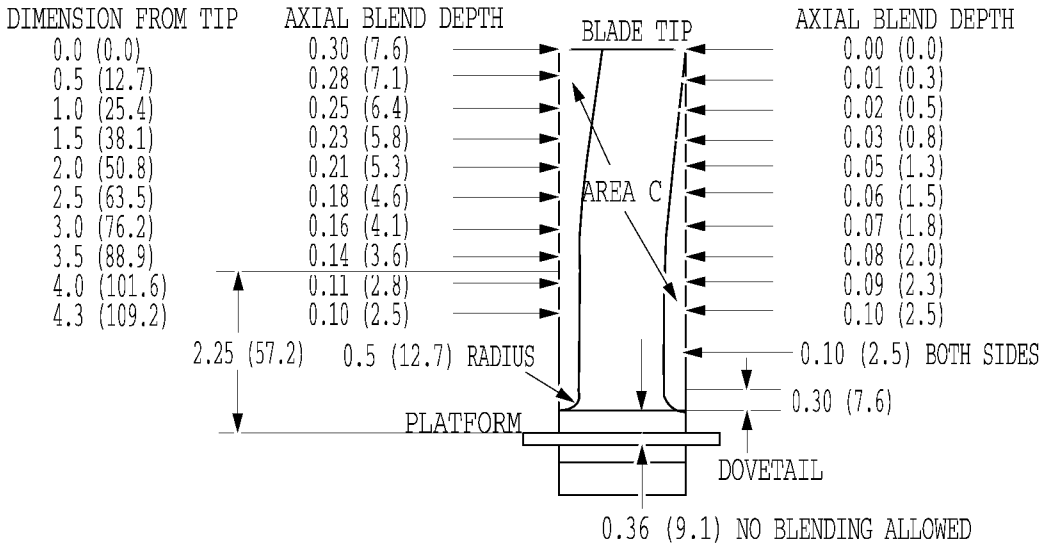
BLADE BLENDING OPTIONS

1257243-00-B

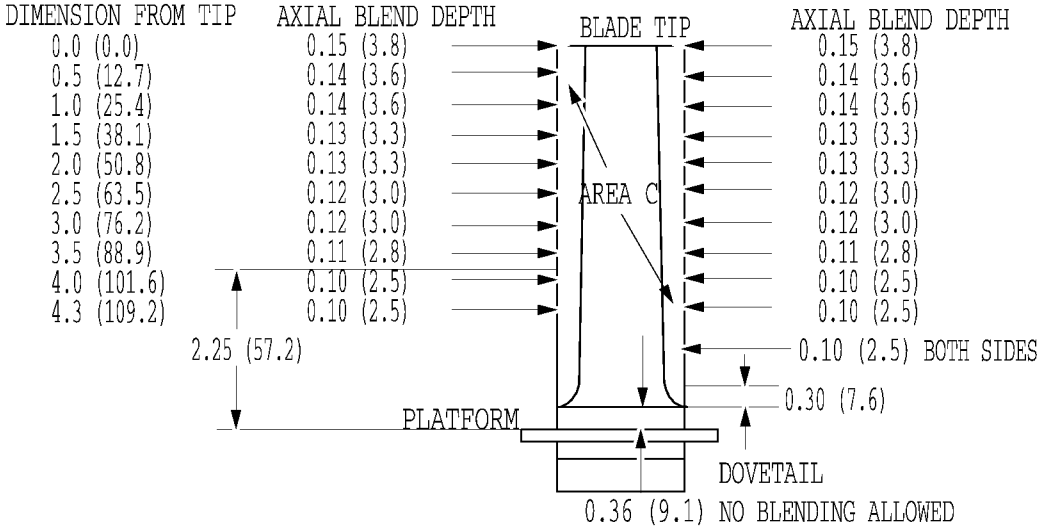
BM5 72 31 00 8 LNMB 00

Stage 2-14 HPC Blade Blend Limits (Sheet 2/16)
Figure 807

R



BLENDING ONE EDGE (LEADING OR TRAILING)



BLENDING BOTH EDGES (LEADING AND TRAILING)

NOTE: DIMENSIONS ARE IN INCHES
(MILLIMETERS IN PARENTHESIS).

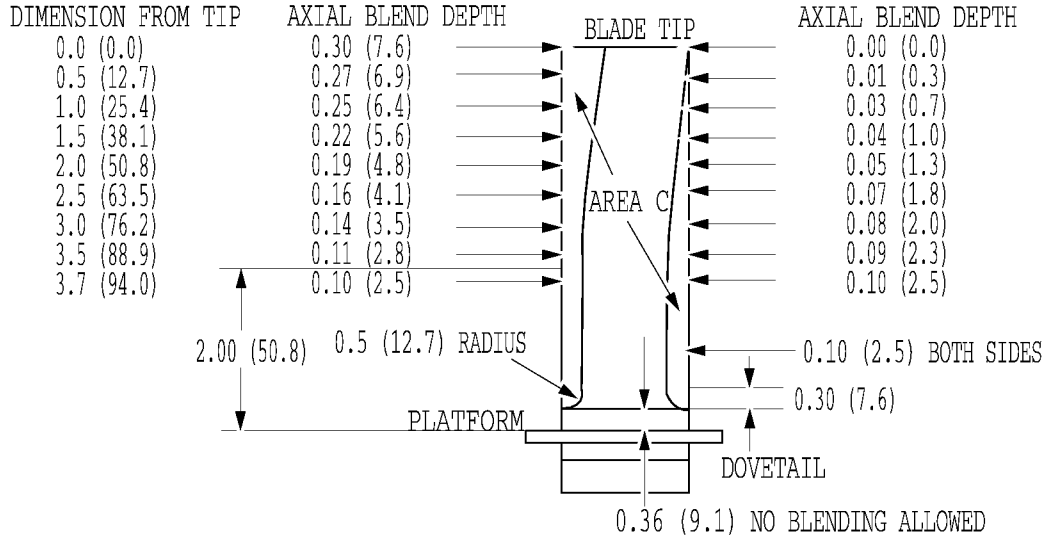
STAGE 2 HPC BLADE

1257244-00-B

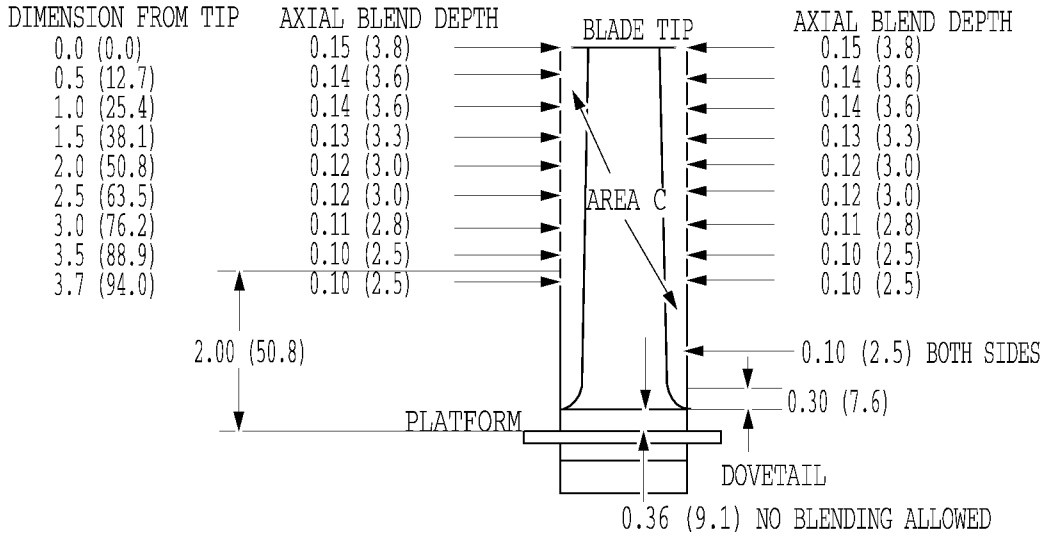
BM5 72 31 00 8 LNMC 00

Stage 2-14 HPC Blade Blend Limits (Sheet 3/16)
Figure 807

R



BLENDING ONE EDGE (LEADING OR TRAILING)



BLENDING BOTH EDGES (LEADING AND TRAILING)

NOTE: DIMENSIONS ARE IN INCHES
(MILLIMETERS IN PARENTHESIS).

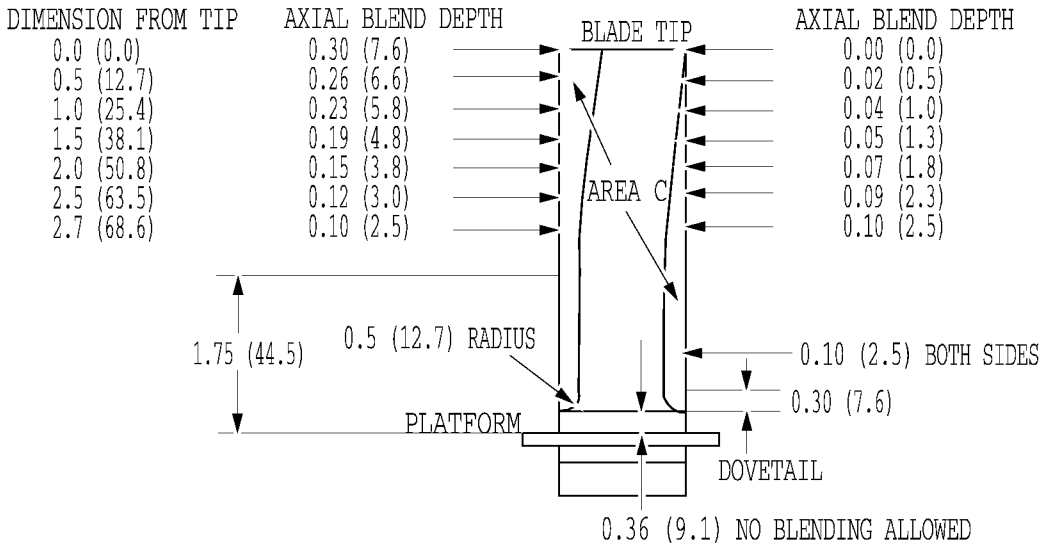
STAGE 3 HPC BLADE

1257245-00-B

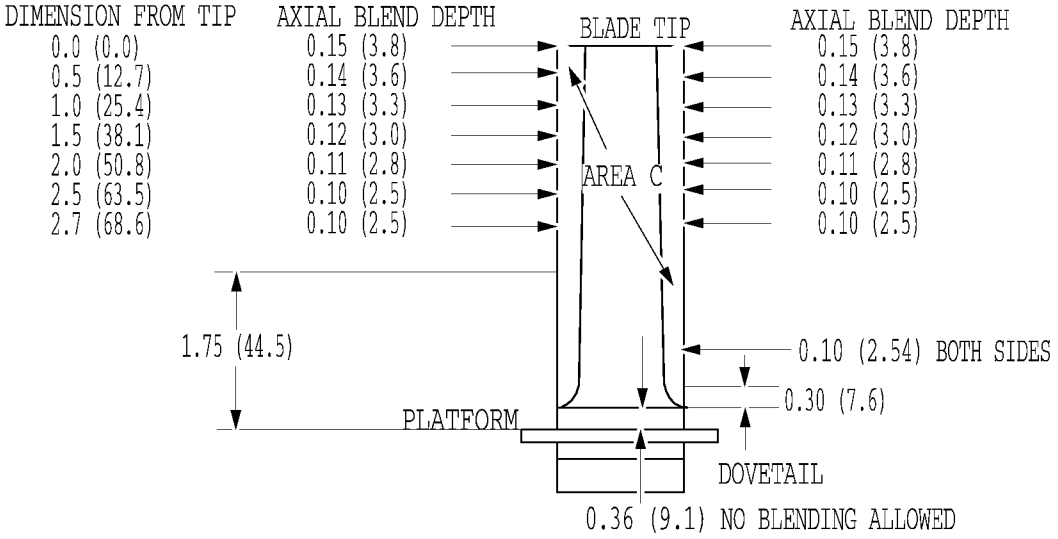
BM5 72 31 00 8 LNMD 00

Stage 2-14 HPC Blade Blend Limits (Sheet 4/16)
Figure 807

R



BLENDING ONE EDGE (LEADING OR TRAILING)



BLENDING BOTH EDGES (LEADING AND TRAILING)

NOTE: DIMENSIONS ARE IN INCHES
(MILLIMETERS ARE IN PARENTHESIS).

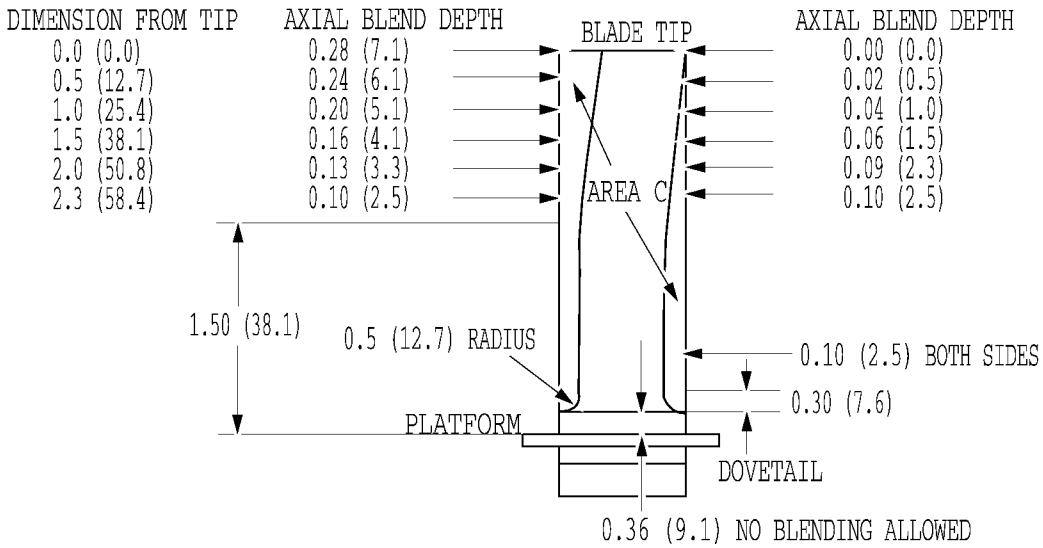
STAGE 4 HPC BLADE

1257246-00-B

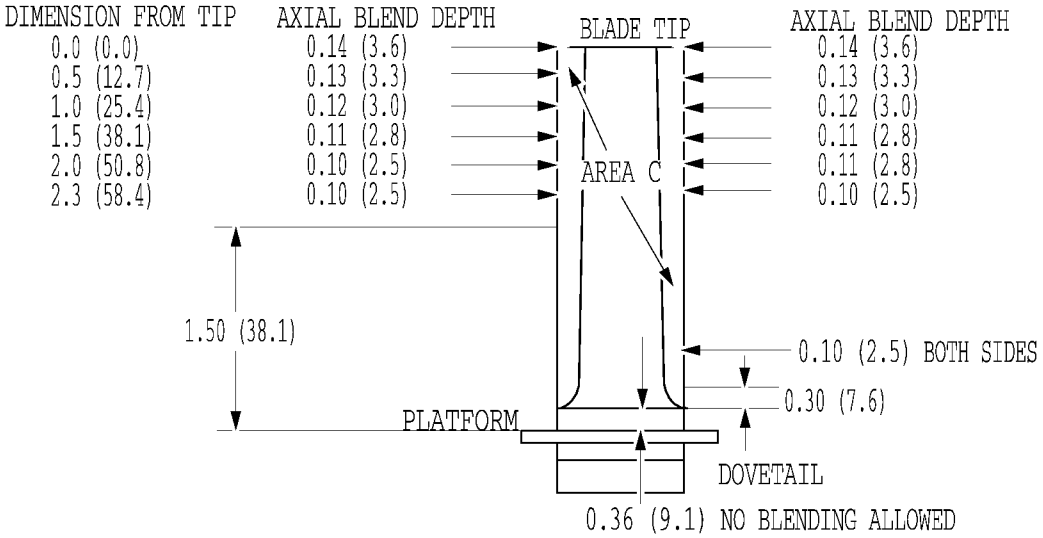
BM5 72 31 00 8 LNME 00

Stage 2-14 HPC Blade Blend Limits (Sheet 5/16)
Figure 807

R



BLENDING ONE EDGE (LEADING OR TRAILING)



BLENDING BOTH EDGES (LEADING AND TRAILING)

NOTE: DIMENSIONS ARE IN INCHES
(MILLIMETERS ARE IN PARENTHESIS).

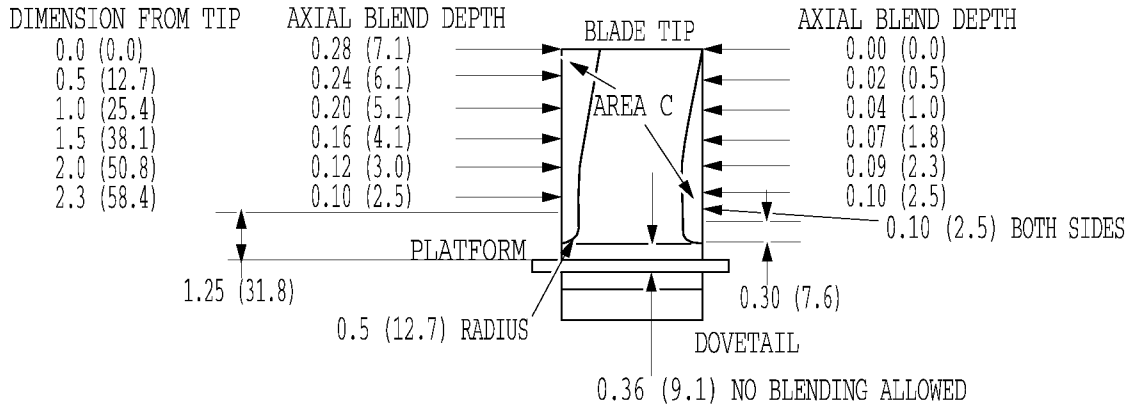
STAGE 5 HPC BLADE

1257247-00-B

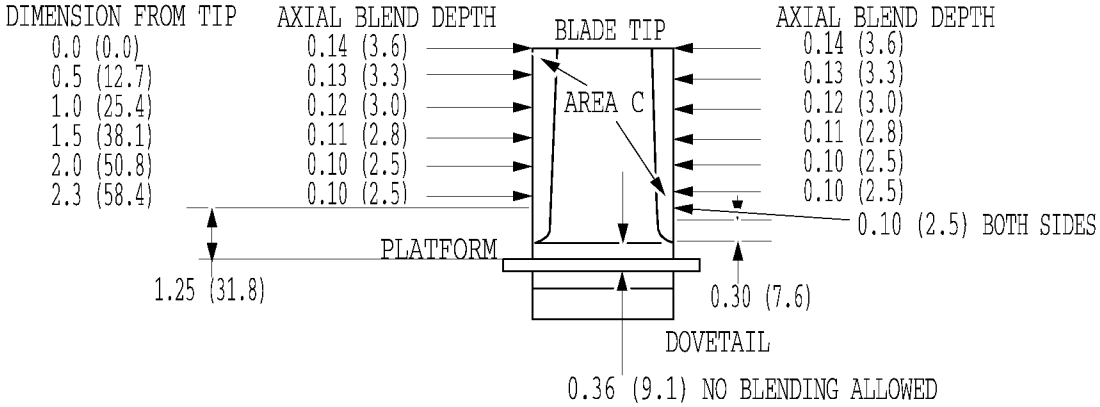
BM5 72 31 00 8 LNMF 00

Stage 2-14 HPC Blade Blend Limits (Sheet 6/16)
Figure 807

R



BLENDING ONE EDGE (LEADING OR TRAILING)



BLENDING BOTH EDGES (LEADING AND TRAILING)

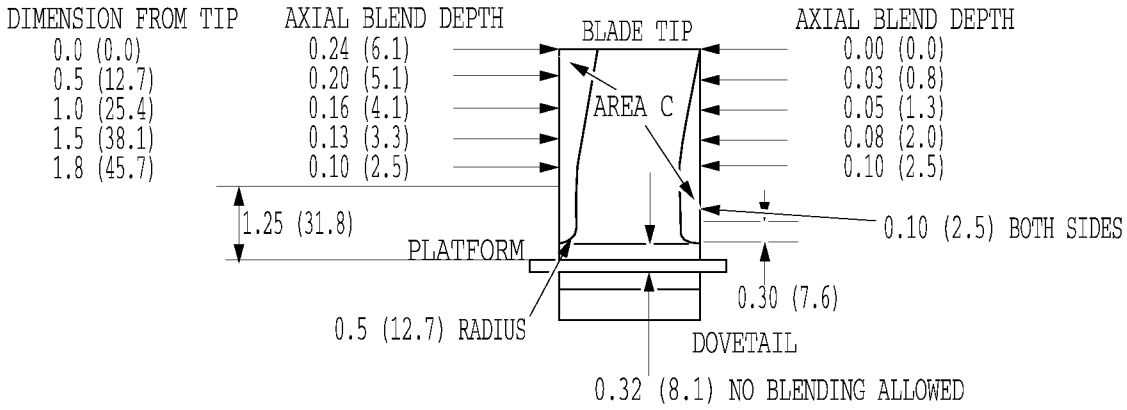
STAGE 6 HPC BLADE

NOTE: DIMENSIONS ARE IN INCHES
(MILLIMETERS ARE IN PARENTHESIS).

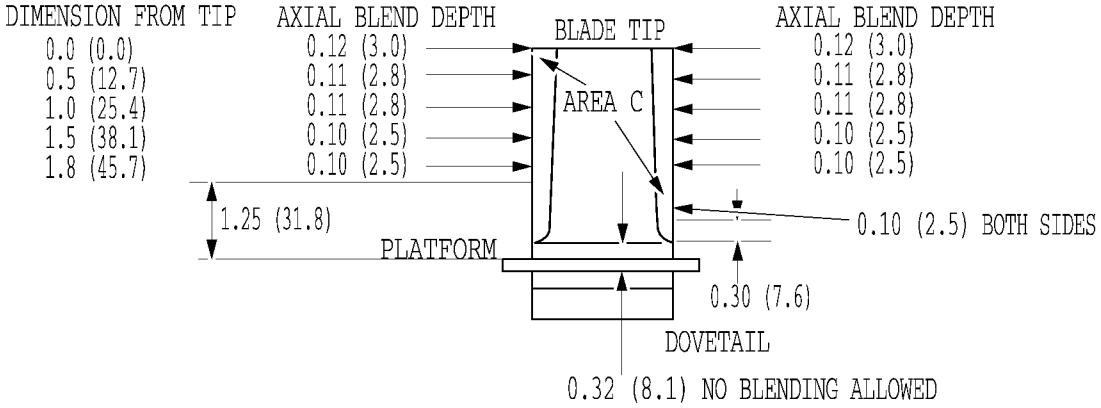
1257248-00-B

BM5 72 31 00 8 LNMG 00

Stage 2-14 HPC Blade Blend Limits (Sheet 7/16)
R Figure 807



BLENDING ONE EDGE (LEADING OR TRAILING)



BLENDING BOTH EDGES (LEADING AND TRAILING)

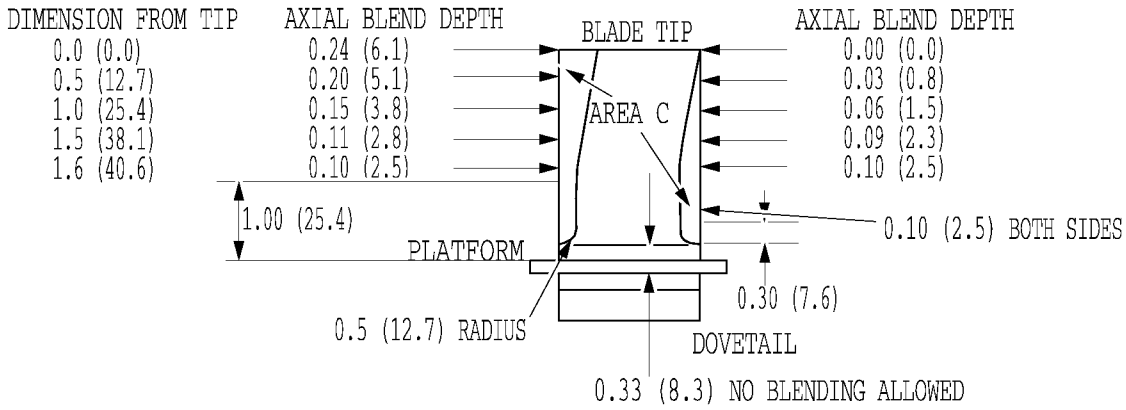
STAGE 7 HPC BLADE

NOTE: DIMENSIONS ARE IN INCHES
(MILLIMETERS ARE IN PARENTHESIS).

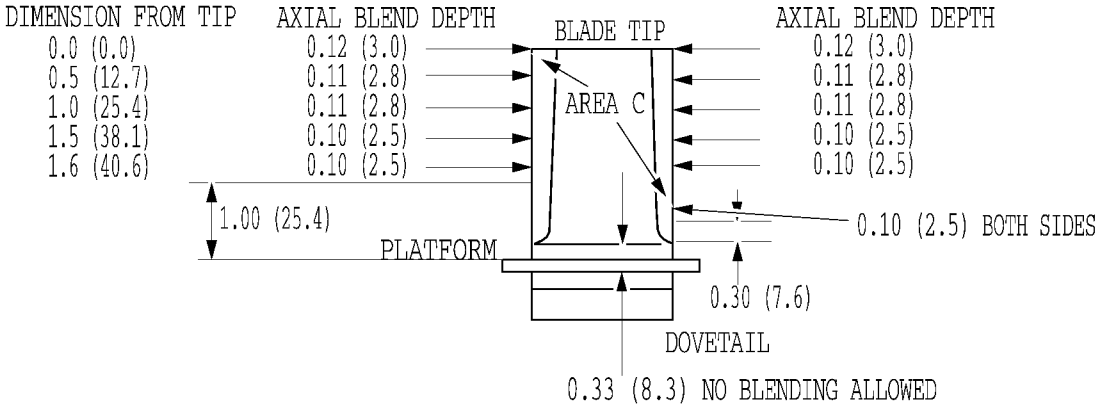
1257249-00-B

BM5 72 31 00 8 LNMH 00

Stage 2-14 HPC Blade Blend Limits (Sheet 8/16)
R Figure 807



BLENDING ONE EDGE (LEADING OR TRAILING)



BLENDING BOTH EDGES (LEADING AND TRAILING)

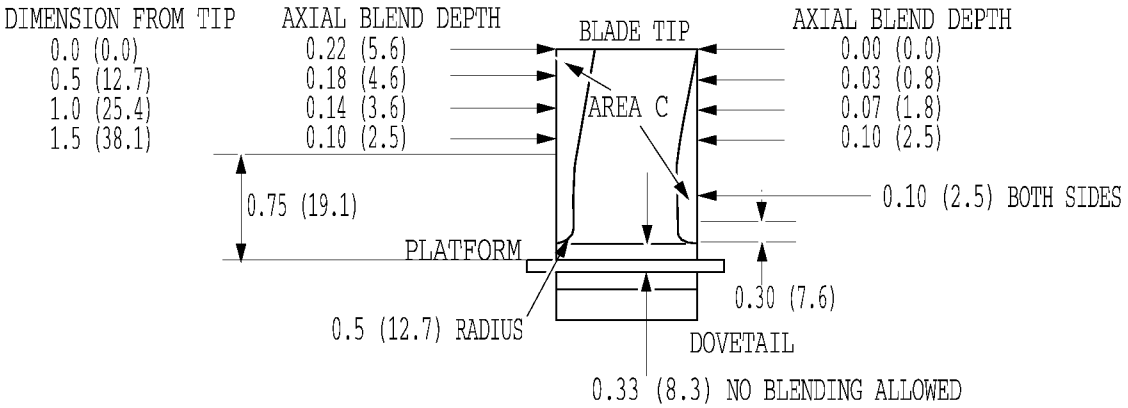
STAGE 8 HPC BLADE

NOTE: DIMENSIONS ARE IN INCHES
(MILLIMETERS ARE IN PARENTHESIS).

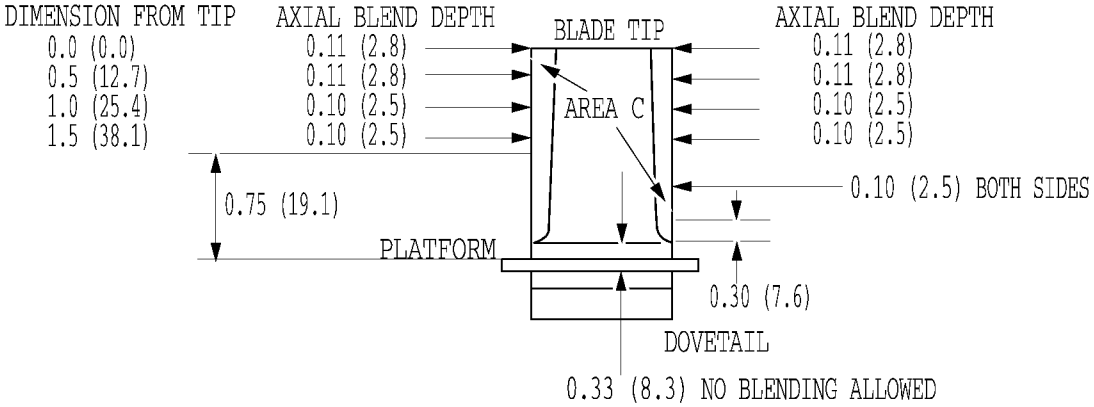
1257250-00-B

BM5 72 31 00 8 LNMJ 00

Stage 2-14 HPC Blade Blend Limits (Sheet 9/16)
R Figure 807



BLENDING ONE EDGE (LEADING OR TRAILING)



BLENDING BOTH EDGES (LEADING AND TRAILING)

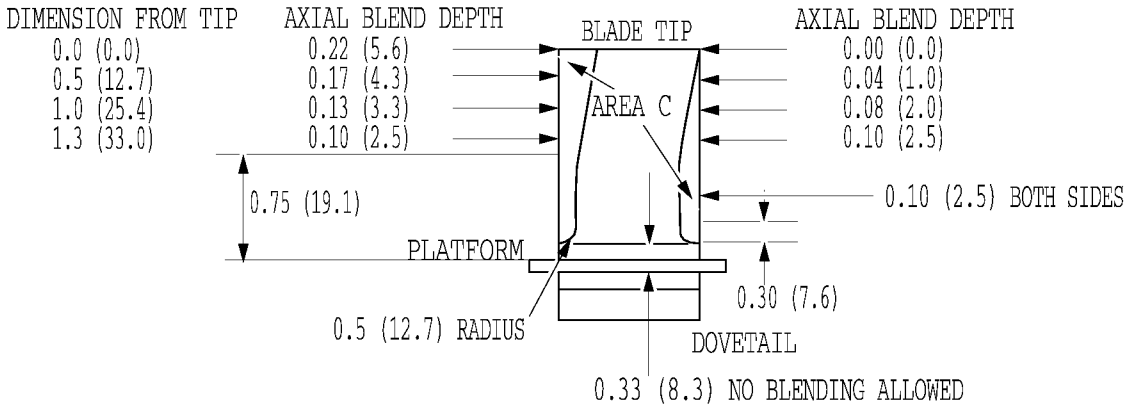
STAGE 9 HPC BLADE

NOTE: DIMENSIONS ARE IN INCHES
(MILLIMETERS ARE IN PARENTHESIS).

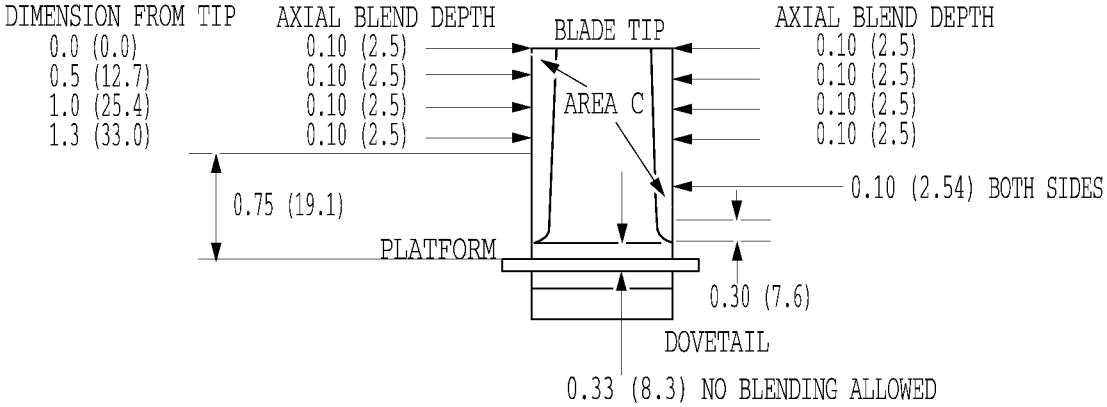
1257251-00-B

BM5 72 31 00 8 LNMK 00

Stage 2-14 HPC Blade Blend Limits (Sheet 10/16)
R Figure 807



BLENDING ONE EDGE (LEADING OR TRAILING)



BLENDING BOTH EDGES (LEADING AND TRAILING)

STAGE 10 HPC BLADE

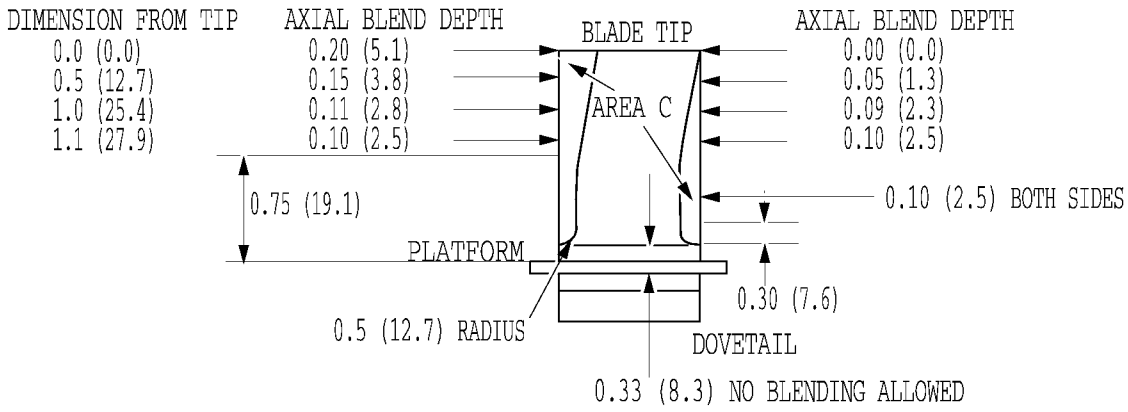
NOTE: DIMENSIONS ARE IN INCHES
(MILLIMETERS ARE IN PARENTHESIS).

1257252-00-B

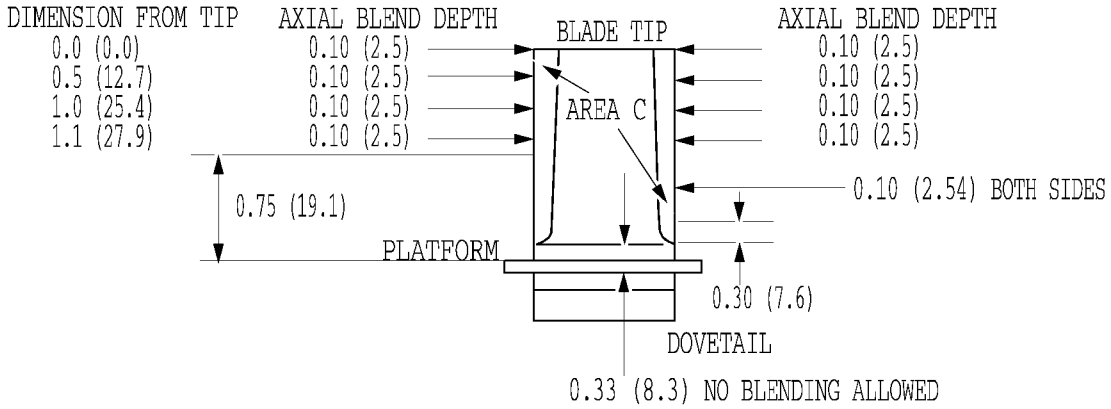
BM5 72 31 00 8 LNML 00

Stage 2-14 HPC Blade Blend Limits (Sheet 11/16)
Figure 807

R



BLENDING ONE EDGE (LEADING OR TRAILING)



BLENDING BOTH EDGES (LEADING AND TRAILING)

STAGE 11 HPC BLADE

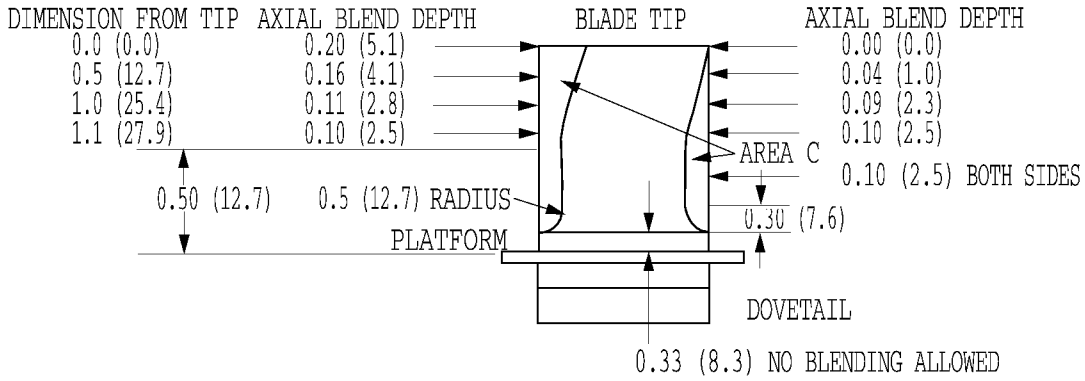
NOTE: DIMENSIONS ARE IN INCHES
(MILLIMETERS ARE IN PARENTHESIS).

1257253-00-B

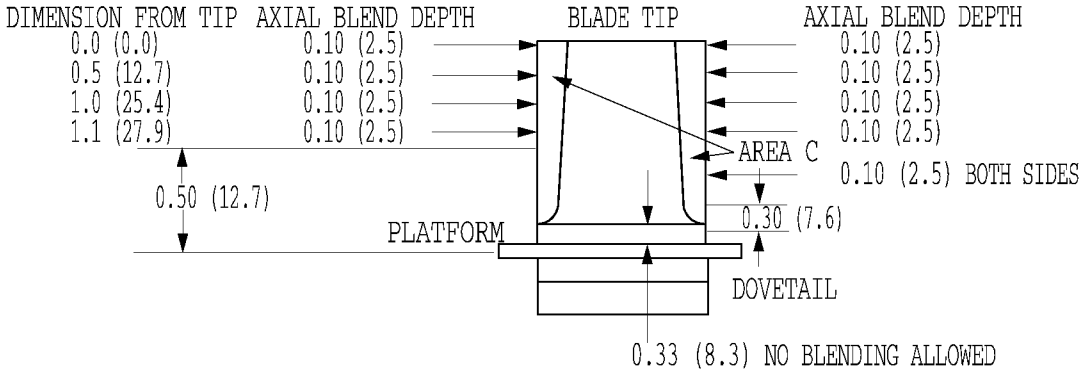
BM5 72 31 00 8 LNMM 00

Stage 2-14 HPC Blade Blend Limits (Sheet 12/16)
Figure 807

R



BLENDING ONE EDGE (LEADING OR TRAILING)



BLENDING BOTH EDGES (LEADING AND TRAILING)

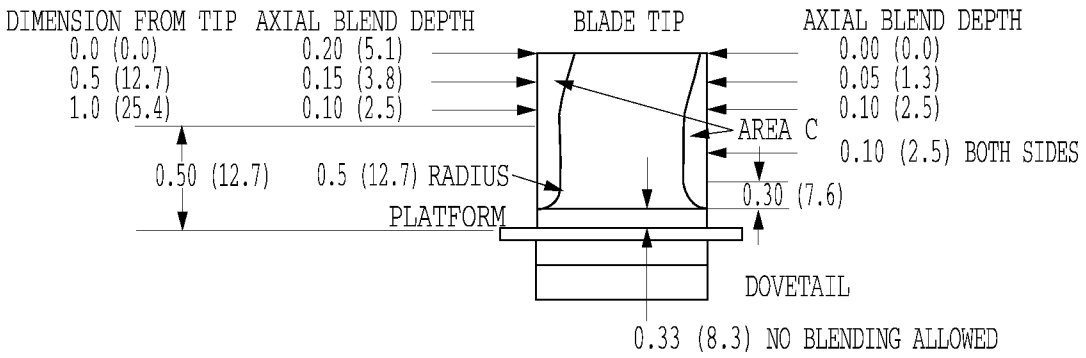
STAGE 12 HPC BLADE

NOTE: DIMENSIONS ARE IN INCHES
(MILLIMETERS ARE IN PARENTHESIS).

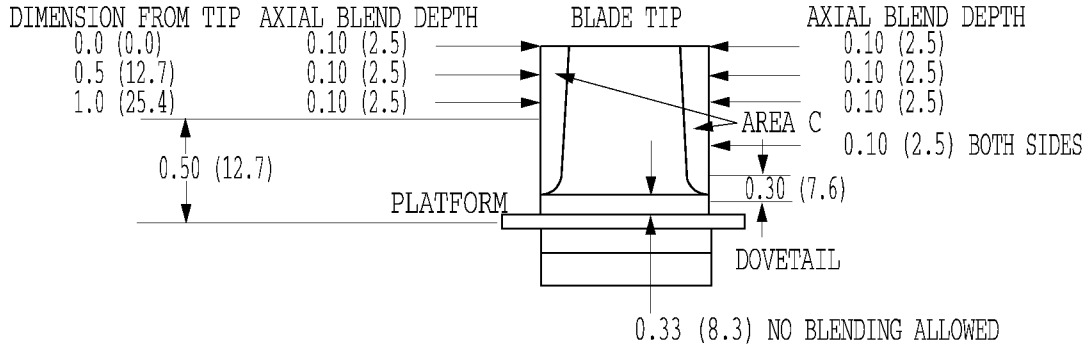
1257254-00-B

BM5 72 31 00 8 LNMN 00

Stage 2-14 HPC Blade Blend Limits (Sheet 13/16)
R Figure 807



BLENDING ONE EDGE (LEADING OR TRAILING)



BLENDING BOTH EDGES (LEADING AND TRAILING)

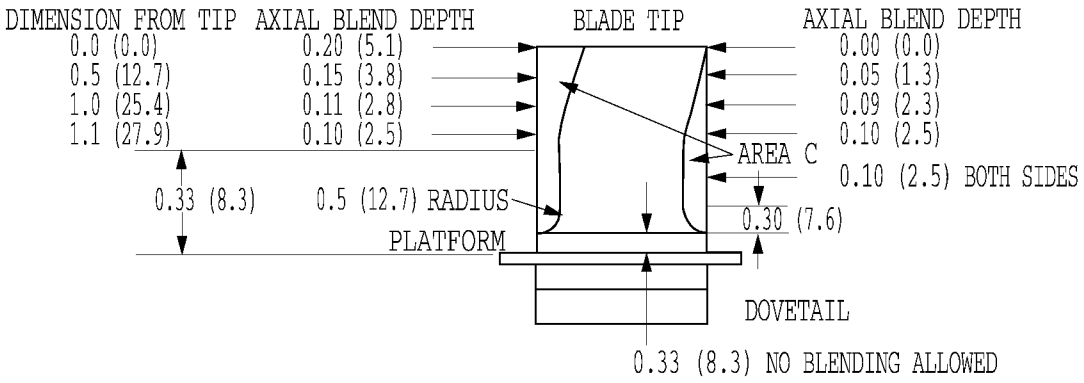
STAGE 13 HPC BLADE

NOTE: DIMENSIONS ARE IN INCHES
(MILLIMETERS ARE IN PARENTHESIS).

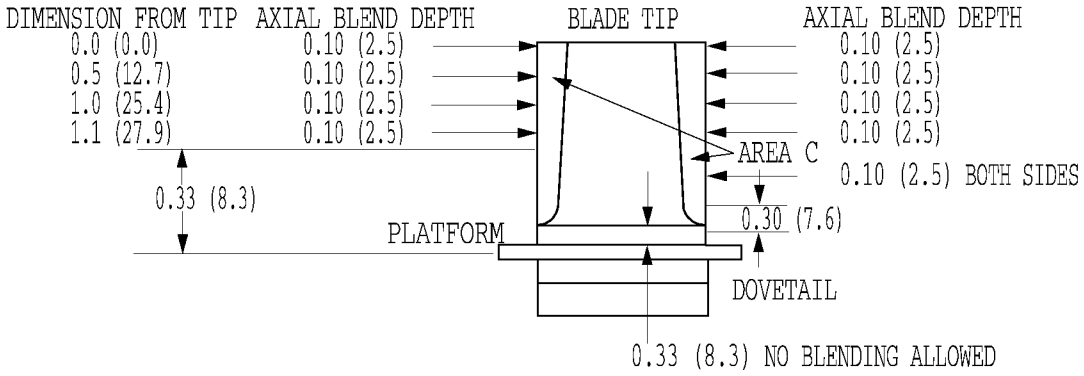
1257255-00-B

BM5 72 31 00 8 LNMP 00

Stage 2-14 HPC Blade Blend Limits (Sheet 14/16)
R Figure 807



BLENDING ONE EDGE (LEADING OR TRAILING)



BLENDING BOTH EDGES (LEADING AND TRAILING)

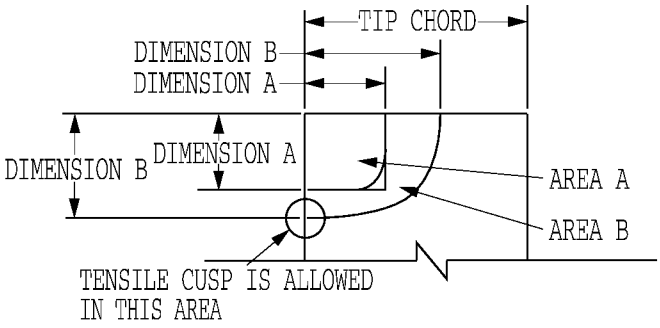
STAGE 14 HPC BLADE

NOTE: DIMENSIONS ARE IN INCHES
(MILLIMETERS ARE IN PARENTHESIS).

1257256-00-B

BM5 72 31 00 8 LNMQ 00

Stage 2-14 HPC Blade Blend Limits (Sheet 15/16)
R Figure 807



LEADING OR TRAILING TIP CORNER

STAGE	ANY NUMBER OF BLADES PER STAGE TO DIMENSION A (1/4 TIP CORNER)	DIMENSION B (1/2 TIP CORNER)	MAXIMUM NUMBER OF BLADES PER STAGE TO DIMENSION B
2	0.61 (15.5)	1.22 (31.0)	4
3	0.41 (10.4)	0.83 (21.1)	6
4	0.38 (9.7)	0.75 (19.1)	6
5	0.36 (9.1)	0.71 (18.0)	6
6	0.32 (8.1)	0.65 (16.5)	6
7	0.30 (7.6)	0.61 (15.5)	6
8	0.28 (7.1)	0.57 (14.5)	6
9	0.27 (6.9)	0.55 (14.0)	6
10	0.28 (7.1)	0.56 (14.2)	6
11	0.24 (6.1)	0.49 (12.4)	6
12	0.23 (5.8)	0.46 (11.7)	6
13	0.24 (6.1)	0.49 (12.4)	6
14	0.24 (6.1)	0.49 (12.4)	6

STAGE 2-14 HPC BLADE ALLOWABLE MISSING TIP CORNER

NOTE: NO SHARP CORNERS AFTER BLENDING,
MINIMUM BLEND RADII IS 0.5 INCH (12.7 mm) RADIUS.

DIMENSIONS ARE IN INCHES
(MILLIMETERS ARE IN PARENTHESIS).

FOR STAGE 1 BLADE REFER TO FIGURE 805 (SHEET 1 AND 2).

1282301-00-B

BM5 72 31 00 8 LNMR 00

Stage 2-14 HPC Blade Blend Limits (Sheet 16/16)
R Figure 807

R Tighten lockscrew (6) (Ref. Fig. 810).
R NOTE : Longer tool tips are used for forward stages and shorter tool
R tips are used for aft stages.
R 2 Apply the light source to the blend tool.
R NOTE : Do not install or remove a tool tip from the drive shaft head
R with the drive shaft head in the zero degree position. If you
R remove the tool tip with the drive shaft head in the zero degree
R position the drive belt will disengage.
R NOTE : Make sure the blend tip is facing away from the operator in the
R 90 degree position. Start the drive motor and make sure the tip
R rotates in the clockwise direction.
R If the direction of rotation is counter clockwise, check the
R drive belt for possible twisted installation.
R CAUTION : IF THE GRIND TIP TURNS COUNTER-CLOCKWISE IN USE, THE TIP CAN
R LOOSEN AND POSSIBLY FALL OFF IN THE ENGINE.
R 3 Put the blend tool tip in the zero degree position and put the blend
R tool tip into the compressor through the borescope access port.
R 4 Move the tool tip from the zero degree to the 90 degree position.
R 5 Put the primary blade edge grinding tip (1) (Ref. Fig. 810) close to
R the HPC blade defect.
R 6 Align the blend tool tip with the blade defect and make certain there
R is correct contact across the total length of the area to be blended.
R NOTE : Do not start the drive motor (14) (Ref. Fig. 808)
R (Sheet 2/2) at this time.
R 7 Use the primary blade edge grinding tip (1) (Ref. Fig. 810) and mark
R the two sides of the blades defect.
R NOTE : The radial length of the blend should be 8 times the max. depth
R of the blend, to each side of the defect (Ref. Fig. 809).
R 8 Simulate blending of the defect by moving the grind tip across the
R marked defect area while making certain correct contact with the blade
R is maintained.
R NOTE : Repeat the simulation until you feel you can complete the
R blending with no problems.
R 9 Start the drive motor (14) (Ref. Fig. 808) (Sheet 2/2) and increase
R the speed. Apply pressure to the grind tip (1) (Ref. Fig. 810) at the
R defect area.
R NOTE : If the grind tip (1) (Ref. Fig. 808) (Sheet 2/2) does not turn
R freely, too much pressure is being applied to the blade edge
R surface.
R 10 During blending, make sure to put a contour on the edge of the blade
R and remove the sharp edges.
R 11 Stop the drive motor (14) (Ref. Fig. 808) (Sheet 2/2).
R 12 Put the grind tip (1) (Ref. Fig. 808) (Sheet 2/2) in the zero degree
R position.
R 13 Remove the grind tip (1) (Ref. Fig. 808) (Sheet 2/2) from the
R borescope access port.
R 14 Put the grind tip (1) (Ref. Fig. 808) (Sheet 2/2) in the 90 degree
R position.
R 15 Loosen the lock screw (6) (Ref. Fig. 810) and remove the grind tip
R (1) (Ref. Fig. 808) (Sheet 2/2) from the drive shaft head (2)
R (Ref. Fig. 808) (Sheet 2/2).

R NOTE : Do not install or remove a tool tip from the drive shaft head with the drive shaft head in the zero degree position. If you remove the tool tip with the drive shaft head in the zero degree position the drive belt will disengage.

(c)Polish the blended defect.

1 Install the polishing ball tip (4) (Ref. Fig. 810) on the drive shaft head (2) (Ref. Fig. 808) (Sheet 2/2) and tighten the lock screw (6) (Ref. Fig. 810).

NOTE : Do not install or remove a tool tip from the drive shaft head with the drive shaft head in the zero degree position. If you remove the tool tip with the drive shaft head in the zero degree position the drive belt will disengage.

2 Put the polishing ball tip (4) (Ref. Fig. 810) in the zero degree position and put in the borescope access port. Next, put drive shaft head (2) (Ref. Fig. 808) (Sheet 2/2) at a 90 degree position.

3 Start the drive motor and polish the blended surface. Stop the drive motor (14) (Ref. Fig. 808) (Sheet 2/2).

4 Put the polishing ball tip (4) (Ref. Fig. 810) in the zero degree and remove from the borescope port.

5 Use the standard borescope probe 1 configuration (magnified 1 : 1 at 7 in.) and inspect blended blades to make sure all the defect was removed.

6 Install the borescope access port plug (Ref. 72-00-00, P. Block 601).

7 Install the borescope core turning pad cover plate (Ref. 72-00-00, P. Block 601).

8 Do an idle leak check of the borescope core turning cover plate (Ref. 71-00-00, P. Block 501).

(4)Follow-up inspection after the borescope blending

(a)A one-time inspection of the blended area(s) is required no sooner than 25 cycles and not later than 50 cycles after the blend repair is completed.

(b)If no indications or unserviceable damage is present within the blended area(s), no additional follow-up inspections are required.

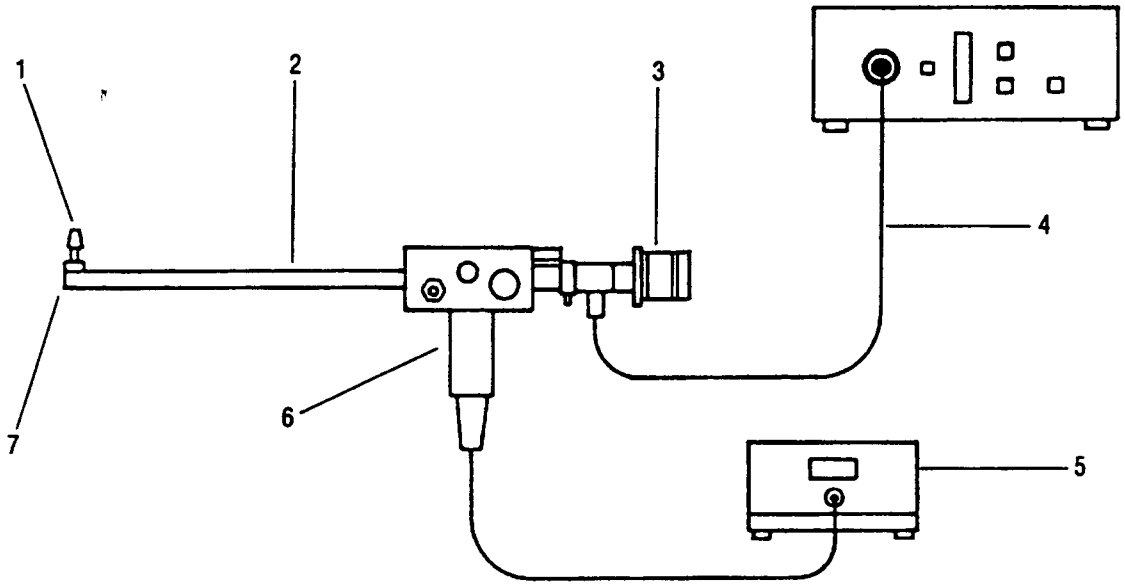
(5)Close-up

(a)Make sure that the work area is clean and clear of tools and miscellaneous items of equipment.

(b)Remove the access platform.

(c)Close the thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).

(d)Remove the safety clips and tags and close the circuit breakers.



LEGEND:

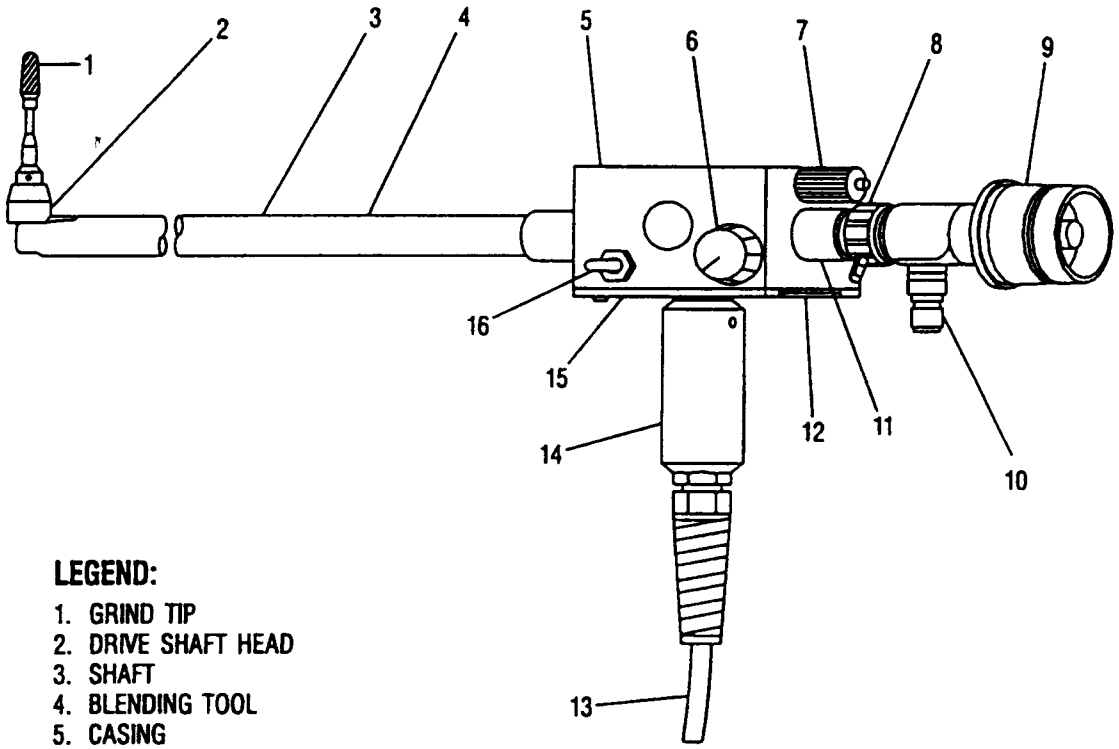
1. ARTICULATING (0-90° + 10°) GRIND/BLENDING HEAD
2. BORESCOPE HOUSING AND WORKING CHANNEL
3. BORESCOPE
4. LIGHT GUIDE CABLE
5. DRIVE MOTOR POWER SUPPLY
6. MOTOR ASSEMBLY
7. ARTICULATION (0-90° + 10°) BLADE BORESCOPE BLENDING TOOL

BM5 72 31 00 8 LPMA 00

1132825-00-A

HPC Blade Borescope Blending Tool (Sheet 1/2)
Figure 808

R



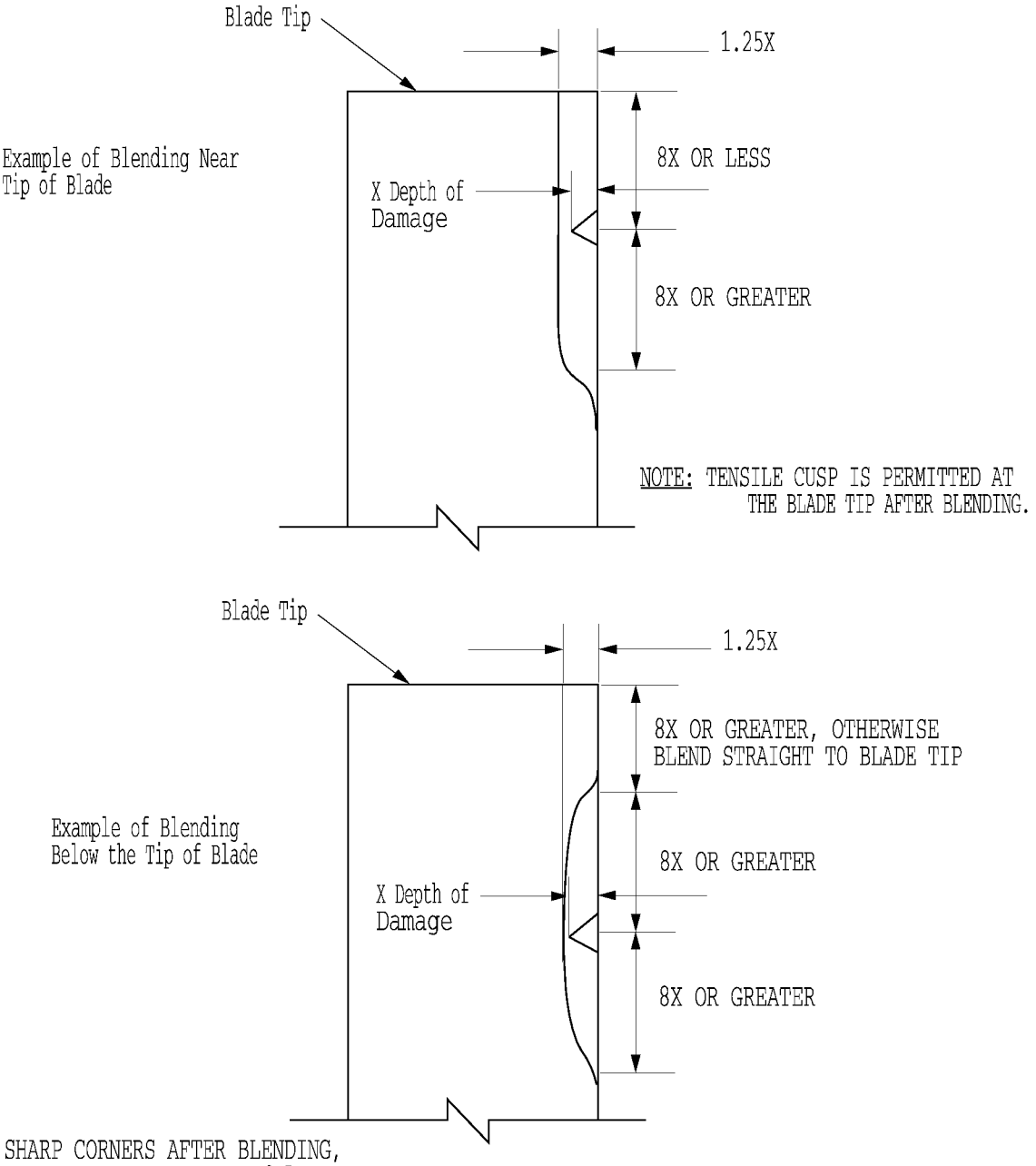
LEGEND:

1. GRIND TIP
2. DRIVE SHAFT HEAD
3. SHAFT
4. BLENDING TOOL
5. CASING
6. MOTOR SPEED CONTROL
7. TIP ARTICULATION CONTROL
8. BORESCOPE LOCK
9. BORESCOPE
10. LIGHT GUIDE CABLE CONNECTION
11. BORESCOPE LENGTH ADJUSTMENT LOCK
12. MOTOR TENSION ADJUSTMENT PLATE
13. ELECTRICAL POWER CABLE
14. DRIVE MOTOR
15. TENSION SCREW
16. ON/OFF SWITCH

BM5 72 31 00 8 LPMJ 00

1132826-00-A

R HPC Blade Borescope Blending Tool (Sheet 2/2)
Figure 808



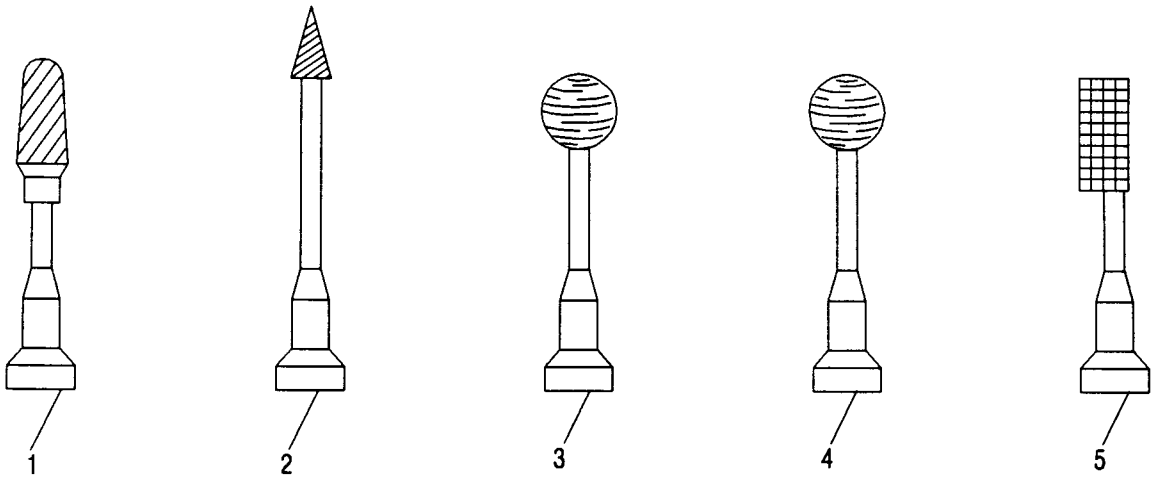
NOTES: NO SHARP CORNERS AFTER BLENDING,
MINIMUM BLEND RADIUS IS R 0.5 INCH
(R 12.7 mm) IS RECOMMENDED.

1281532-00

BM5 72 31 00 8 LRM0 01

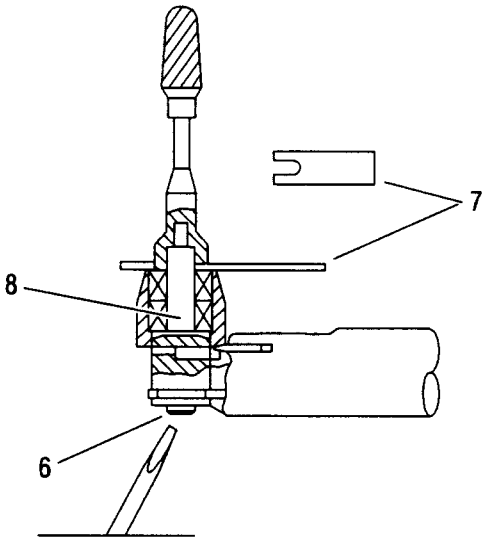
R

Blend Area Example
Figure 809



LEGEND:

1. PRIMARY BLADE EDGE GRINDING TIP
2. BLADE GRINDING TIP
3. ABRASIVE BALL GRINDING TIP
4. POLISHING BALL TIP
5. MEASURING GRID TIP
6. SCREW DRIVER INSERTED IN SPINDLE LOCK SCREW
7. SPANNER WRENCH
8. SPINDLE



1132828-04-/

BM5 72 31 00 8 LTM0 01

Borescope Blend Tool Tip Selection/Blend Tip Installation
Figure 810

R

COMPRESSOR VARIABLE STATOR ASSEMBLY - INSPECTION/CHECK

1. General

A. Maintenance of the compressor stator assembly covered in this section of the manual is limited to the external areas.

B. All parts removed, except bolts and nuts, should be temporarily matchmarked or numbered for assembly in original alignment and position.
NOTE : The dimensional inspections specified are necessary when parts have been replaced or repaired which would affect the clearances or seating. When parts are re-installed in the matchmarked position and the mating or adjacent parts have not been changed, a clearance inspection is not necessary. Make certain you do a correct inspection at every installation and examine for seating of the mechanical joints.

2. Equipment and Materials

ITEM	DESIGNATION
A. 2C6962	Gage, Sight - VSV
B. 2C6966	Gage, Sight - VSV
C. 2C8016	Gage, Sight - VSV Stage 5
D. Material No.C01-007	Adhesives, Plastics, Sealants (Ref. 70-00-00)
E. Material No.C02-004	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
F. Material No.C02-058	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 72-00-00, P. Block 601	Engine - General
- 72-32-00, P. Block 801	Compressor Variable Stator Assembly
- 73-21-01, P. Block 501	Main Engine Control

3. Procedure

A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open thrust reverser cowl doors. (Ref. 71-13-00, P. Block 301).

B. Visual Inspection/Checks
Visually inspect external areas. Confirm all cracks by fluorescent penetrant Inspection. Inspect for the conditions that follow :
(1)Casing for : (Ref. Fig. 601)

INSPECTION/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(a) Nicks, gouges and scratches in :		

INSPECTION/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
1 Skin	One per each 4 square in (26 square cm) area 0.015 in. (0.38 mm) deep, 1 in (25.4 mm) long after removal of high metal, provided no sharp areas appear	
2 Flanges and ribs	Any Number 0.060 in. (1.52 mm) deep, 0.5 in. (12.7 mm) long with a min. separation of 2 in. (51 mm) after removal of high metal	
(b) Cracks in :		
1 Casing skin	Not serviceable	See limit extensions, (Ref. 72-00-00, P. Block 601)
2 Ribs	Any amount, but not into casing skin	Remove crack by blending. Maximum serviceable depth is flush with casing skin. Minimum serviceable radius of blend is equal to depth
3 Circumferential flanges		
- Radially outward from bolt holes	1 per hole, maximum 1 hole per flange	
- Bolt hole to skin	Not serviceable	See limit extensions, (Ref. 72-00-00, P. Block 601)
4 Horizontal flanges	Not serviceable	
5 Fillet between aft circumferential flange and horizontal flange	Not serviceable	
(c) Grooves worn by actuation ring spacers	Any number 0.025 in. (0.064 mm) deep after removal of high metal	
(d) Hot spots (discoloration	Serviceable if metal is not crazed and cracks are not present	
(e) Bulges	Not serviceable when associated with heat discoloration	

(2)Stage 7, 8 and 11 manifolds for : (Ref. Fig. 601)

INSPECTION/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(a) Nicks, gouges and scratches	One per each 4 square in. (26 square cm) area 0.015 in. (0.38 mm) deep, 1 in. (25 mm) long after removal of high metal, if no sharp areas appear	
(b) Cracks (except stage 8 manifold end caps)	Not serviceable	
(c) Stage 8 manifold end caps	Not serviceable	See limit extensions, (Ref. 72-00-00, P. Block 601)
(d) Rubs, wear, or chafing	Not serviceable	See limit extensions, (Ref. 72-00-00, P. Block 601).
(e) Dents	Any number 0.250 in. (6.35 mm) deep, if there is a radius at the bottom and no cracks. Minimum separation 2 in. (51 mm)	
(f) Through holes	Not serviceable	

(3)Horizontal Flange Bolts and Nuts For : (Ref. Fig. 602)

INSPECTION/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(a) Loose, broken or missing	Not serviceable	Replace all loose, broken or missing bolts/nuts plus adjacent bolts/nuts. Lubricate threads and washer faces with Material C02-058. Tighten new bolts and nuts

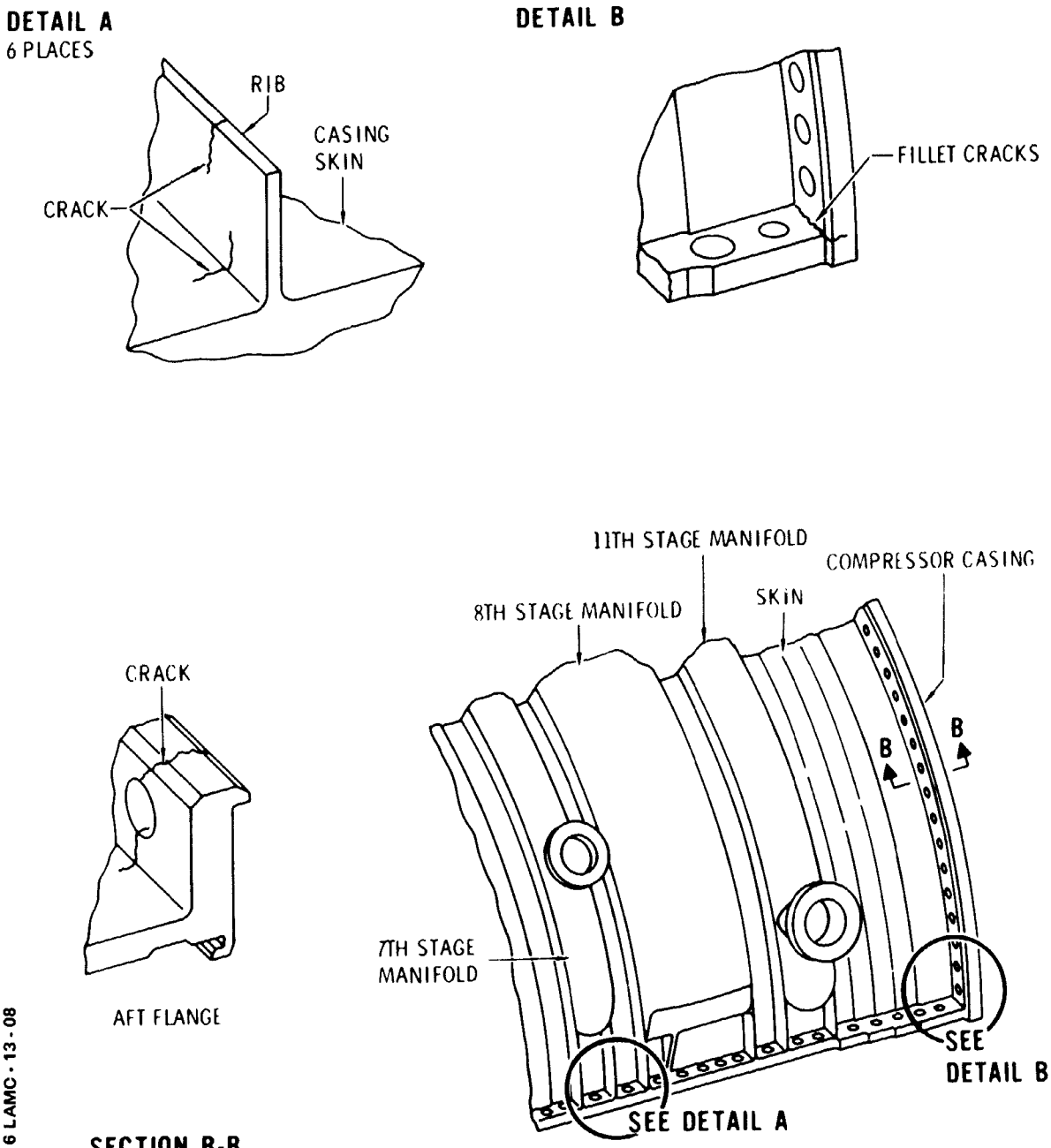
NOTE : Bolts are numbered with No.1 starting at aft end.
NOTE : If more than 5 horizontal flange bolts/nuts are loose, broken or missing, replace all bolts/nuts in both horizontal flanges.

(4)Vane Assembly For : (Ref. Fig. 603, 604, 605) (Ref. Fig. 606)

INSPECTION/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(a) Looseness	All radial and side movement is permitted if bushing or washer is not missing. No vane metal can touch the case metal.	See Over-Serviceable - Limit-Extensions, (Ref. 72-00-00)

INSPECTION/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(b) Vane trunnion metal that touches the case bore metal	Not serviceable	Replace the outer bushing (Ref. 72-32-00, P. Block 801)
CAUTION : OFF-SCHEDULE STATOR VANE OPERATION MAY REQUIRE A SPECIAL INSPECTION OF THE ENGINE TO BE PERFORMED (REF. 72-00-00, P. BLOCK 601). IF STATOR AND ROTOR PARTS ARE BOTH AFFECTED, THE ENGINE MAY HAVE TO BE REPLACED IMMEDIATELY.		
(c) Bent lever arms	Any number 2 degrees or less	See off-schedule vane inspection requirements, (Ref. 72-00-00, P. Block 601) before replacing lever arms. Replace lever arms per approved repairs.
NOTE : Visually inspect. If bent lever arms are seen visually, use inspection tools from sets 2C6966, 2C6962 and 2C8016 to measure the amount. Accessibility of vanes will vary between engine installations. By using a lighted mirror and/or pen light, it is possible to inspect more positions.		
CAUTION : OFF-SCHEDULE STATOR VANE OPERATION MAY REQUIRE A SPECIAL INSPECTION OF THE ENGINE TO BE PERFORMED (REF. 72-00-00, P. BLOCK 601). IF STATOR AND ROTOR PARTS ARE BOTH AFFECTED, THE ENGINE MAY HAVE TO BE REPLACED IMMEDIATELY.		
(d) Misassembled or broken lever arms	Not serviceable	See off-schedule vane inspection requirements, (Ref. 72-00-00, P. Block 601) before replacing lever arms. Replace lever arms per approved repairs.
NOTE : If stage 5 lever arms are visually found misassembled with tangs distorted use tool 2C8016 to measure the amount of off-schedule angle.		
(e) Cracks		
1 Narrow tang opposite the actuation arm pin on stage 5 lever arms	Any amount as long as tang is rigid	
2 All other areas	Not serviceable	Replace lever arm (Ref. 72-32-00, P. Block 801)

(5)Actuation Rings (Aluminum IGV through stage 4) for : (Ref. Fig. 607)



BM5 72 32 00 6 LAMC - 13 - 08
DM5

Compressor Casing Crack Inspection
Figure 601

NOTE:

1. APPLY MIL-T-5544 (C02-001) LUBRICANT TO THREADS AND WASHER FACES OF BOLTS AND NUTS BEFORE INSTALLATION.

2. HORIZONTAL FLANGE BOLT HOLE NUMBERING STARTS AT THE AFT END. "L" REFERS TO 9:00 O'CLOCK FLANGE AND "R" REFERS TO 3:00 FLANGE AFT LOOKING FORWARD.

3. HOLE NUMBERS 2, 5, 9, 15, 21, 25, 32 AND 36 ON RIGHT AND LEFT SIDES OF THE CASING ARE FOR BODY BOUND BOLTS. THEY ARE SHADED IN THE FIGURE BELOW.

4. ASSEMBLE CASE HALVES AND INSTALL ALL BOLTS. ALL BOLT HEADS ARE IN UPPER CASING EXCEPT IN HOLE NUMBERS 14R, 7L AND 13L.

5. AVOID TURNING BODY BOUND BOLTS. TAP THEM WITH A PLASTIC MALLET.

6. TORQUE NUTS TO THE VALUES IN TABLE 1 STARTING WITH HOLE NUMBER 2 AND ALTERNATING FROM LEFT TO RIGHT ADVANCING FORWARD IN THE FOLLOWING SEQUENCE: 2L, 2R, 5L, 5R, 9L, 15L, 21L, 21R, 25L, 25R, 32L, 32R, 36L AND 36R. TORQUE THE REMAINING NUTS ALTERNATING FROM LEFT TO RIGHT TO VALUES SHOWN IN TABLE 1.

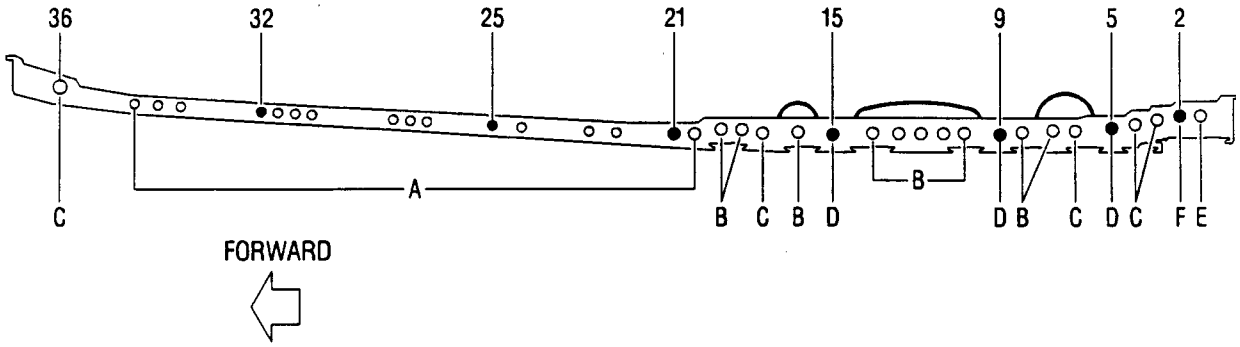
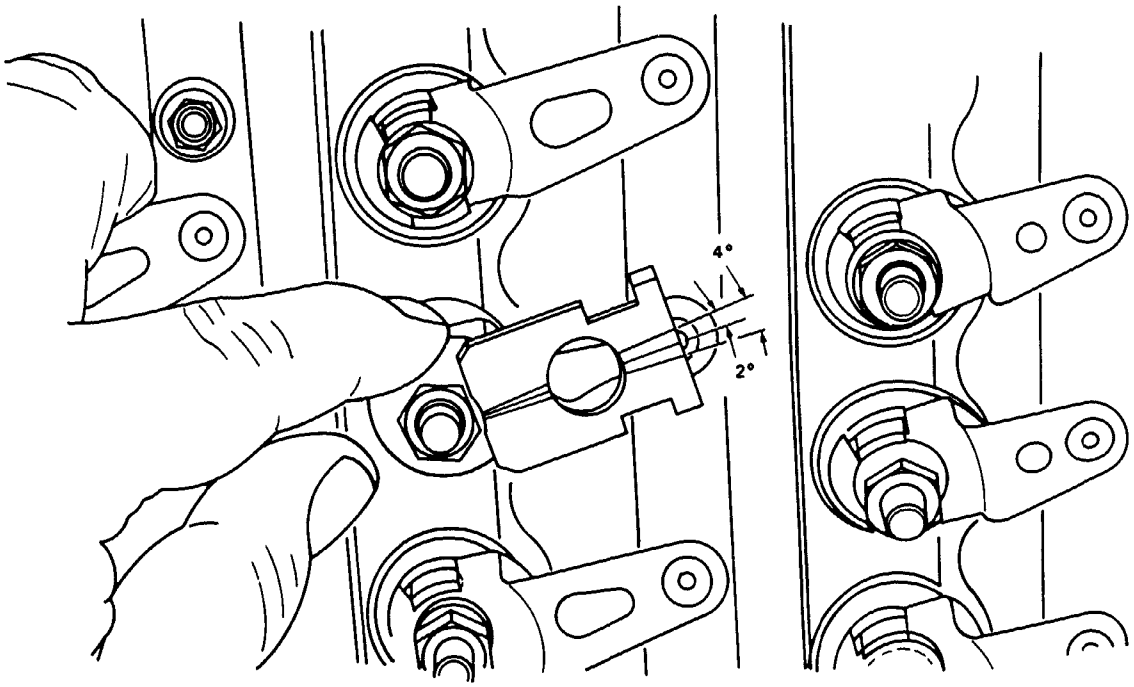


TABLE 1		
BOLT IDENT.	**NOMINAL THREAD SIZE**	**TORQUE LB-IN. (N•M)**
A	0.3125 IN.-18	210-230 (2.37-2.60)
B	0.3750 IN.-24	380-420 (4.29-4.75)
C	0.4375 IN.-20	570-630 (6.44-7.12)
D	0.5000 IN.-20	860-940 (9.72-10.62)
E	0.4375 IN.-20	730-790 (8.25-8.92)
F	0.5000 IN.-20	1115-1175 (12.60-13.27)

1156336-00-A

BM5 72 32 00 6 LCM0 01

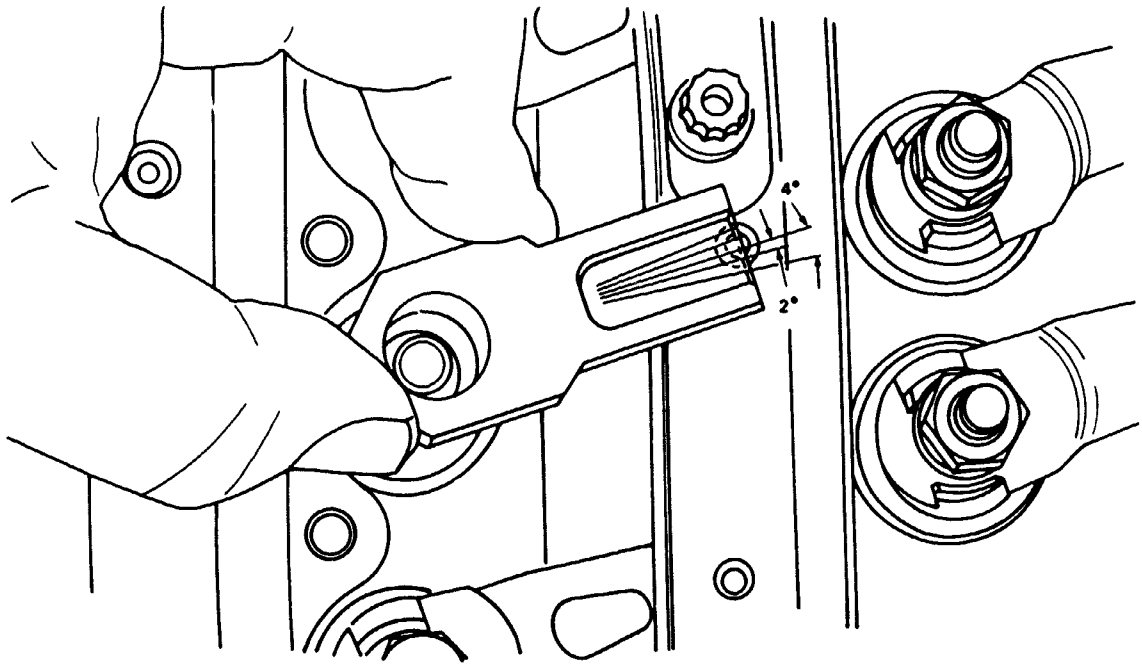
Compressor Stator Casing Horizontal Flange Bolting
Figure 602



BM5 72 32 00 6 LEMO-13-07
DM5

CF8-3513-00-C

Inspection for Bent Lever Arms Using 2C6966 Tool
Figure 603



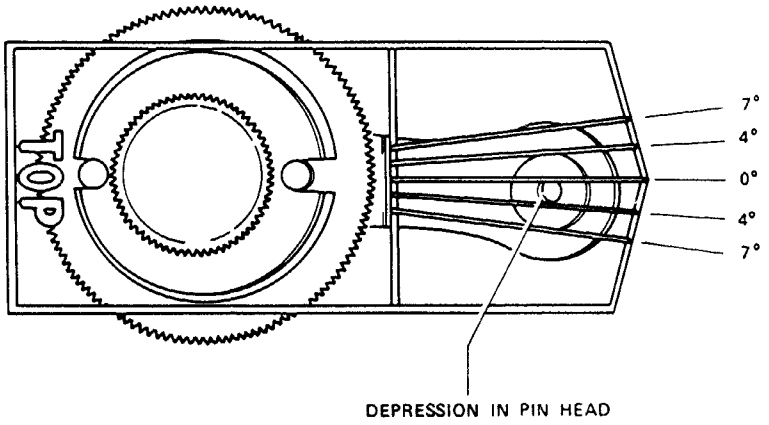
BM5 72 32 00 6 LGMO.13.08
DM5

CF8-3514-00-C

Inspection for Bent Lever Arms Using 2C6962 Tool
Figure 604

TO READ VANE OFF–SCHEDULE ANGLE :

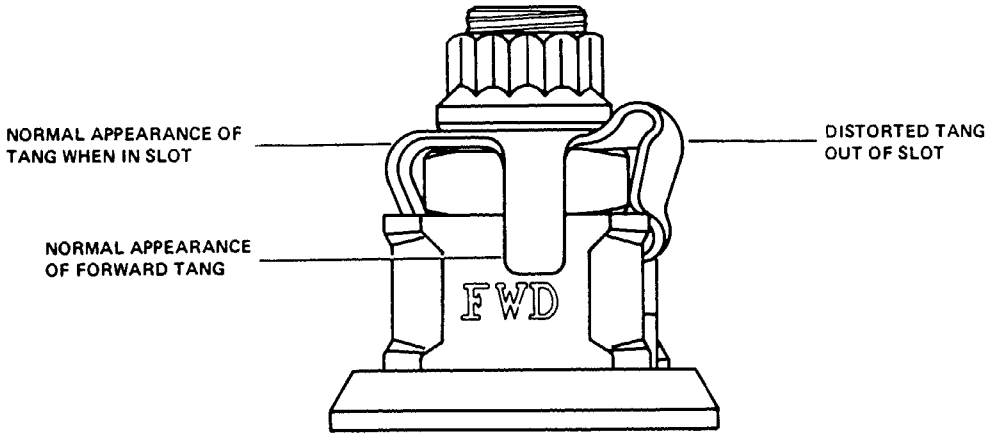
1. ALIGN LINES ON TOP AND BOTTOM OF CLEAR PLASTIC PIECE TO ELIMINATE PARALLAX WHEN READING ANGLE.
2. LOCATION OF DEPRES–SION IN PIN HEAD INDICATES VANE OFF–SCHEDULE ANGLE. ILLUSTRATION IS APPROXIMATELY 2 DEGREES OFF SCHEDULE.



BM5 72 32 00 6 LJMO 13 07
DM5

CF8-3768-00-C

Measurement of OFF-Schedule Angle Using Tool 2C8016
Figure 605



BM5 72 32 00 6 LLMO 13 07
DM5

CF8-6125-00-C

Stage 5 Lever Arm With Distorted Tangs
Figure 606

INSPECTION/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(a) Cracks in side walls, adjacent to nuts	Any number, 0.4 in. (10.0 mm) max. in either direction circumferentially from nut centerline	
(b) Cracks in both ID and OD wall between nut and end of ring	Two per end, from first nut to end of ring, provided nut is tight and will not rotate	
(c) All other cracks	Not serviceable	
(d) Broken	Not serviceable	See off-schedule vane inspection requirements (Ref. 72-00-00, P. Block 601).

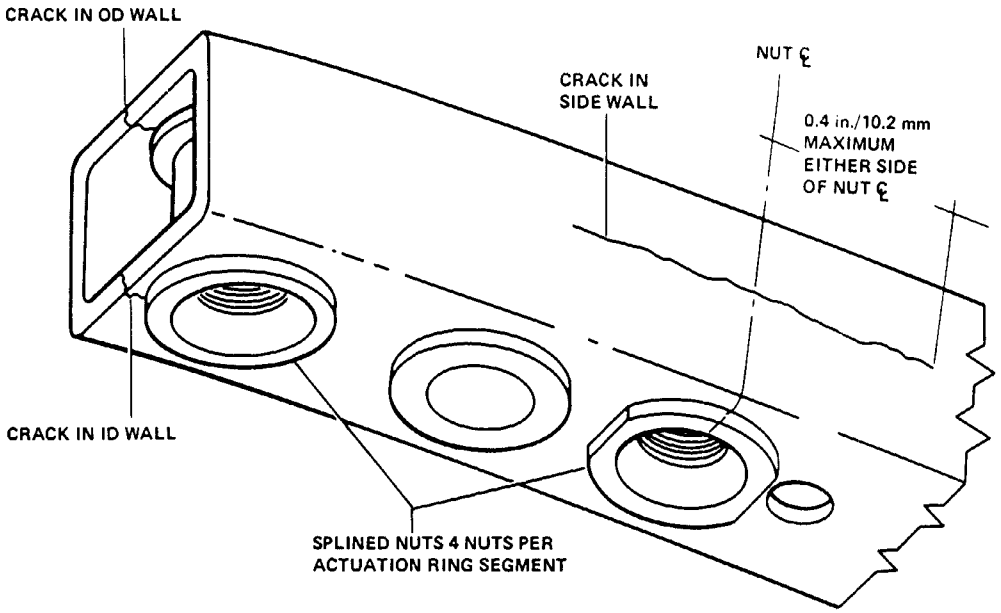
(6)Actuation Ring Spacers For : (Ref. Fig. 608, 609)

INSPECTION/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(a) Loose or out of adjustment	Not serviceable	Adjust to obtain the correct spacer-to-casing clearances shown in figure as "M" TORQUE locknut to between 70 and 90 lbf.in. (0.79 and 1.02 m.daN).
(b) Nut loose in actuation ring	Not serviceable	One spacer per actuation ring segment may be backed off until the spacer head is against the ring - and locked in that position to prevent further wear of actuation ring. RTV (C01-007) may be applied around the loose nut to stabilize it in the ring

(7)Vane Lever Arm Pin Sleeve For :

INSPECTION/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(a) Torn or any portion missing	Any number	

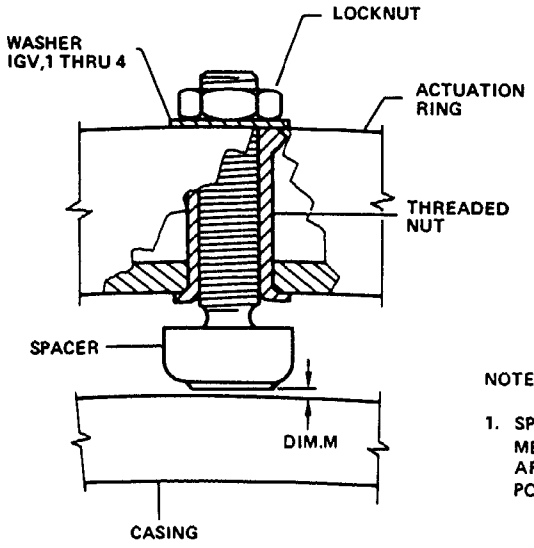
(8)Connector Links for :



BM5 72 32 00 6 LNMO-13-07
DM5

CF8-6122-00-C

Actuation Ring Crack Limits
Figure 607



STAGE	DIMENSION M			
	MIN		MAX	
	IN	MM	IN	MM
IGV	0.002	0.05	0.004	0.10
1	0.002	0.05	0.004	0.10
2	0.002	0.05	0.004	0.10
3	0.002	0.05	0.004	0.10
4	0.005	0.13	0.007	0.18
5	0.017	0.43	0.019	0.48

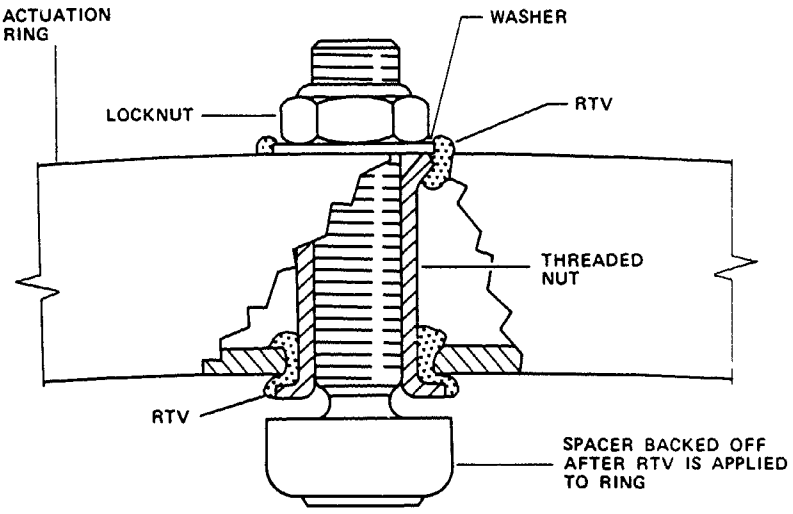
NOTES :

1. SPACER-TO-CASING CLEARANCES ARE TO BE MEASURED WITH THE VANE LEVER ARMS POINTING AFT – THIS CORRESPONDS TO THE ZERO ANGLE POSITION WITH A PROTACTOR INSTALLED.

BM5 72 32 00 6 LPMO-13-07
DM5

CF8-3176-00-C

Actuation Ring Spacer Clearance
Figure 608



BM5 72 32 00 6 LRMO-13-07
DM5

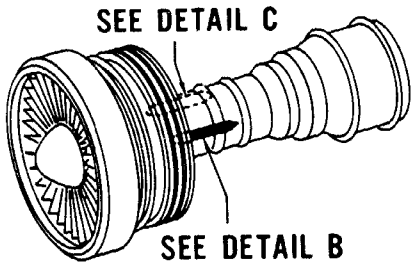
CF8-6126-00-C

Loose Actuation Ring Spacer Nut Stabilized with RTV
Figure 609

INSPECTION/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(a) Broken	Not serviceable	See off-schedule vane inspection requirement (Ref. 72-00-00, P. Block 601).
(b) Cracked, not separated or broken	Not serviceable	Replace cracked connector link (Ref. 72-32-00, P. Block 801).

(9)VSV Actuation Lever For : (item 10) (Ref. Fig. 610)

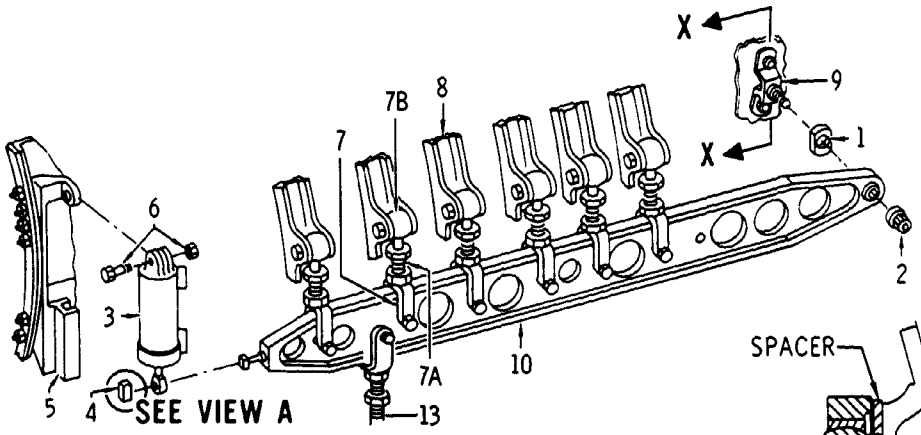
INSPECTION/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(a) Spherical bearing looseness :		
1 Ball within race	0.010 in. (0.25 mm) diametrically	Replace lever (Ref. 72-32-00, P. Block 801)
NOTE : There is no limit for looseness in the axial direction, but axial looseness is controlled by radial looseness		
2 Race within lever	Not serviceable	Replace lever (Ref. 72-32-00, P. Block 801).
(b) Slot loaded bearing looseness :		
1 Ball within race	0.010 in. (0.25 mm) diametrically	Replace bearing ball (Ref. 72-32-00, P. Block 801).
NOTE : There is no limit for looseness in the axial direction, but axial looseness is controlled by radial looseness.		
2 Race within lever	Not serviceable	Replace lever (Ref. 72-32-00, P. Block 801).
3 Missing VSV slot loaded bearing seal boot	Serviceable	
NOTE : Seal boots reduce contamination and vibration of the VSV slot loaded bearings.		
(c) Spherical or slot loaded bearing tightness :		
1 Ball within race	Not serviceable	Spray a coat of Material No.C02-004 to loosen.



LEGEND:

1. SPACER
2. NUT
3. ACTUATOR
4. ACTUATION LEVER GUIDE
5. BRACKET
6. BOLT, NUT
7. CLEVIS
7A. PUSHROD
7B. ROD END BEARING
8. CONNECTING LINKS
9. ACTUATOR LEVER MOUNT
10. ACTUATOR LEVER
12. LOCKING BRACKET
13. FEEDBACK PUSHROD

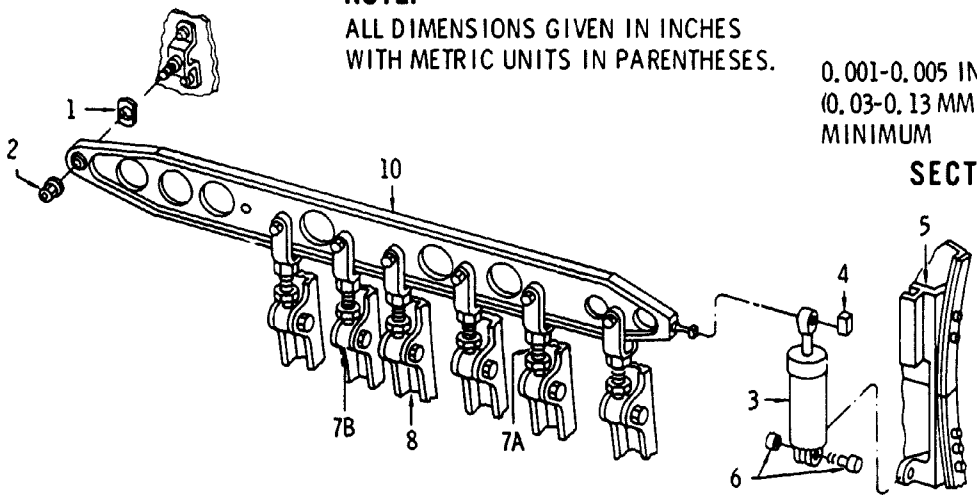
DETAIL B

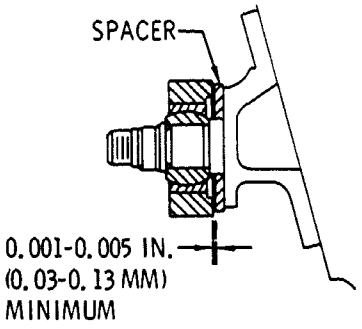


VIEW A

DETAIL C

NOTE:
ALL DIMENSIONS GIVEN IN INCHES
WITH METRIC UNITS IN PARENTHESES.





SECTION X-X

CF8-C3275-00-A

BM5 72 32 00 6 LTMO - 13 - 08
DM5

VSV Actuation Lever Assembly
Figure 610

(10)Actuation Lever Guide and Guide Bracket Assembly for (items 4 and 5) : (Ref. Fig. 610)

INSPECTION/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(a) Gap between guide and guide channel wall	0.015 in. (0.38 mm) max.	Replace guide and bracket. Rig VSV system (Ref. 73-21-01, P. Block 501)
(b) All Areas for :		
1 Cracks	Not serviceable	Replace guide and bracket. Rig VSV system (Ref. 73-21-01, P. Block 501)
2 Nicks, dents and scratches (except spherical bearing in guide) bracket)	Permitted if not more than 0.005 in. (0.13 mm) in depth	Blend 0.060 in. (1.52 mm) min. radius.

(11)Examine the VSV rod-end bearing (7B) as follows : (Ref. Fig. 610)

INSPECTION/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(a) Spherical bearing looseness :		
1 Ball in the race	Permitted if not more than 0.010 in. (0.25 mm) diametric movement.	Replace the VSV clevis assy (Ref. 72-32-00, P. Block 801)
NOTE : There is no limit for the looseness in the axial direction, but the axial looseness is controlled by the radial looseness.		
(b) Slot loaded bearing looseness :		
1 Ball in the race	Permitted if not more than 0.010 in. (0.25 mm) diametric movement.	Replace the bearing ball (Ref. 72-32-00, P. Block 801). If a rod-end housing is damaged, replace the clevis assy (Ref. 72-32-00, P. Block 801).
NOTE : There is no limit for the looseness in the axial direction, but the axial looseness is controlled by the radial looseness.		
(c) Spherical or slot loaded bearing tightness :		
1 Ball in the race	None permitted.	Spray a coat of Material No.C02-004 to loosen.

C. Close-Up

(1)Close thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
Remove safety clips and tags and close the appropriate circuit breakers.

COMPRESSOR VARIABLE STATOR ASSEMBLY -

APPROVED REPAIRS

1. General

A. Maintenance of the compressor stator assembly covered in this section of the manual is limited to the external areas.

B. All parts removed, except bolts and nuts, should be temporarily matchmarked or numbered for assembly in original alignment and position.
NOTE : The dimensional inspections specified are required when parts have been replaced or repaired which would affect the clearance or seating. When parts are reinstalled in the matchmarked position and the mating or adjacent parts have not been changed, clearance inspection may be omitted. Inspection checks which confirm proper seating of mechanical joints must be taken at every installation.

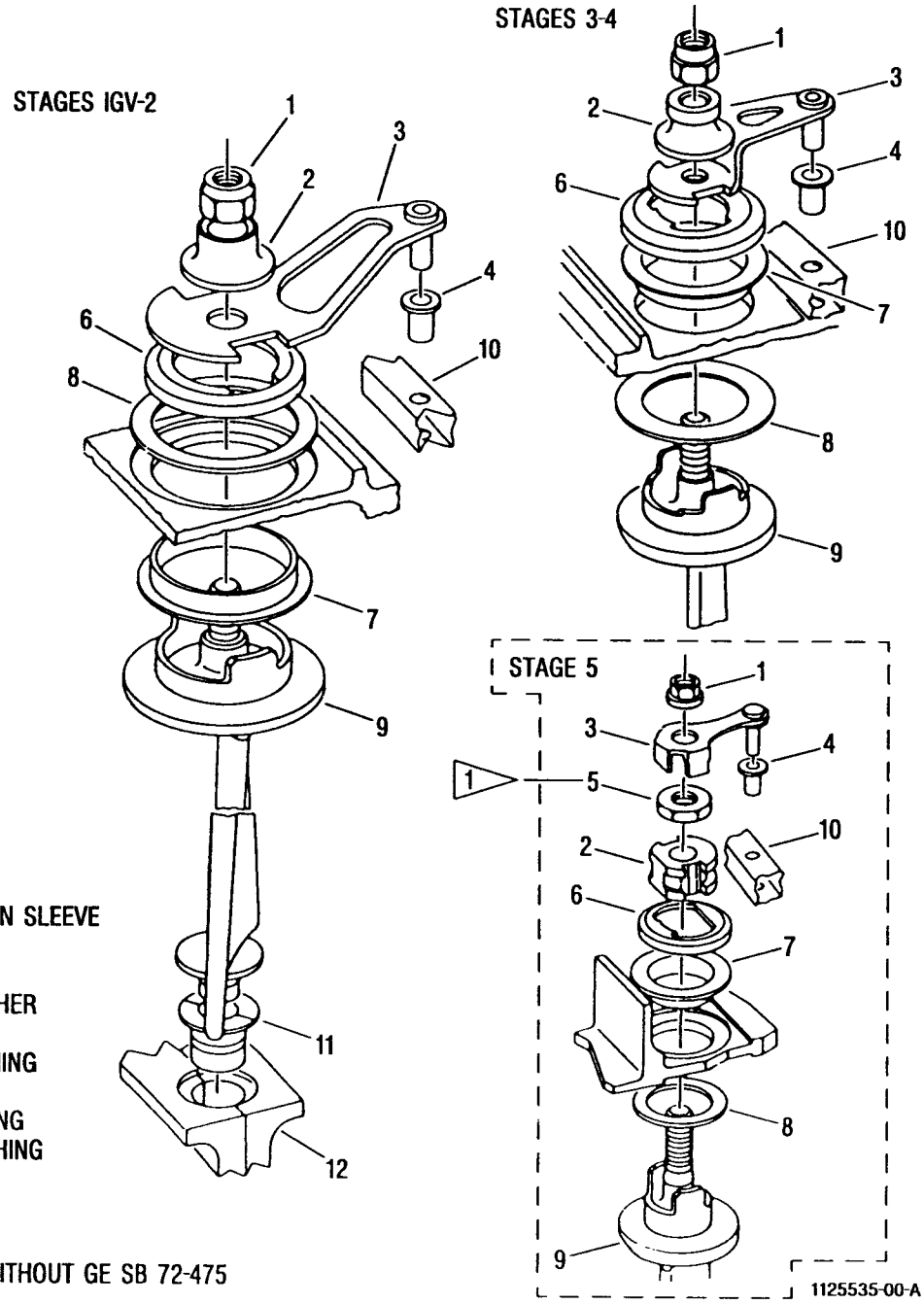
2. Replacement of VSV Lever Arm-Stages IGV Through 2

A. Equipment and Materials

ITEM	DESIGNATION
(1)2C6965	Slip Wrench
(2)	Circuit Breaker Safety Clips
(3)	Access Platform
(4)Material No.C05-003	Inspection and Marking Compounds (Ref. 70-00-00)
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up
(1)Open, safety and tay the circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Install access Platform.

C. Removal of Lever Arm (Ref. Fig. 801)
(1)Matchmark spacer and vane tang to casing OD, using Marks-A-Lot (C05-003), to aid in reassembly.
(2)Loosen locknut (1) and back off nut so that half of the nut threads are still engaged with vane stud.
CAUTION : YOU MUST SAFETY-WIRE THE VANE CAREFULLY. IF THE VANE FALLS INTO THE CASE, ENGINE REMOVAL FOR DISASSEMBLY TO REMOVE VANE IS REQUIRED.
(3)Lift lever arm (3) and secure vane (10) under the lever arm using lockwire. Hold lockwire taut to prevent vane from falling into case ; remove nut, sleeve (2), and lever arm.
(4)Replace pin sleeve (4) in actuation ring if necessary.



LEGEND:

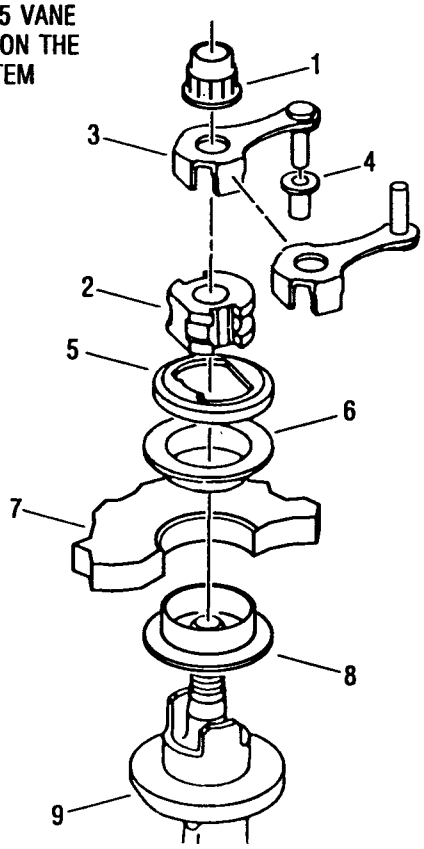
1. LOCK NUT
2. SLEEVE
3. LEVER ARM
4. LEVER ARM PIN SLEEVE
5. JAM NUT
6. SPACER
7. BUSHING/WASHER (FLANGED)
8. WASHER/BUSHING
9. VANE
10. ACTUATION RING
11. FLANGED BUSHING
12. SHROUD

1 ENGINES WITHOUT GE SB 72-475

BM5 72 32 00 8 LAMA 00

Variable Vane Assembly Configurations
(Sheet 1/2)
Figure 801

PHASE 2AB-1 STAGE 5 VANE WITH THE LETTER H ON THE END OF THE VANE STEM



LEGEND:

1. LOCK NUT
2. SLEEVE
3. LEVER ARM
4. LEVER ARM PIN SLEEVE
5. SPACER
6. BUSHING/WASHER (FLANGED)
7. HPC CASE
8. WASHER/BUSHING
9. VANE

ENGINES WITH GE SB 72-475

1125534-00-A

BM5 72 32 00 8 LAMC 00

Variable Vane Assembly Configurations
(Sheet 2/2)
Figure 801

D. Installation (Ref. Fig. 801)
(1)Install new lever arm, sleeve, and locknut ; align matchmarks.
CAUTION : REPLACE ANY NUT WITH A RUN-ON TORQUE OF LESS THAN 5 LBF.IN. (0.056 m.daN) OR MORE THAN 40 LBF.IN. (0.452 m.daN).
(2)Remove lockwire and TORQUE locknut to run-on-torque plus 50-60 lfb.in. (0.57 - 0.68 m.daN) using slip wrench 2C6965P03.
(3)Check vane assembly for binding by shaking vane between thumb and forefinger. Slight movement should be felt.

E. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Remove access platform.
(3)Close fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301). Remove safety clips and tags and close circuits breakers.

3. Replacement of VSV Lever Arm-Stages 3 and 4

A. Equipment and Materials

ITEM	DESIGNATION
(1)2C6965	Slip Wrench
(2)	Circuit Breaker Safety Clips
(3)	Access Platform
(4)Material No.C05-003	Inspection and Marking Compounds (Ref. 70-00-00)
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up
(1)Open, safety and tag the circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Install access platform.

C. Removal (Ref. Fig. 801)
(1)Matchmark spacer and vane tang to casing OD, using Marks-A-Lot (C05-003), to aid in reassembly.
(2)Loosen locknut (1) and back off nut so that half of the nut threads are still engaged with vane stud.
CAUTION : VANE FALLING INTO CASING REQUIRES ENGINE REMOVAL FOR DISASSEMBLY TO REMOVE VANE.
(3)Lift lever arm (3) and secure vane (10) under the lever arm using lockwire. Hold lockwire taut to prevent vane from falling into case ; remove nut, sleeve (2), and lever arm.
(4)Replace pin sleeve (4) in actuation ring if necessary.

D. Installation (Ref. Fig. 801)
(1)Install new lever arm, sleeve, and locknut ; align matchmarks.
CAUTION : REPLACE ANY NUT WITH A RUN-ON TORQUE OF LESS THAN 5 LBF.IN. (0.056 m.daN) OR MORE THAN 40 LBF.IN. (0452 m.daN).

(2)Remove lockwire and tighten locknut to run-on-torque plus 85-95 lbf.in. (0.96-1.08 m.daN) using slip wrench 2C6965P03.
(3)Check vane assembly for binding by shaking vane between thumb and forefinger. Slight movement should be felt.

E. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Remove access platform.
(3)Close fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301). Remove safety clips and tags and close circuits breakers.

4. Replacement of Stage 5 VSV Lever Arm

A. Equipment and Materials

ITEM	DESIGNATION
(1)	Circuit Breaker Safety Clips
(2)	Access Platform
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up
(1)Open, safety and tag the circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors.
(2)Install access platform.

C. Removal (Ref. Fig. 801)
(1)Remove locknut (1) and lever arm (3).
(2)Replace pin sleeve (4) in actuation ring if necessary.

D. Installation (Ref. Fig. 801)
(1)Install new lever arm and locknut.
(2)TORQUE locknut to between 90 and 100 lfb.in. (1.02 and 1.13 m.daN).

E. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Remove access platform.
(3)Close fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301). Remove safety clips and tags and close circuits breakers.

5. VSV Outer Flanged Bushing Removal/Installation

A. Equipment and Materials

ITEM	DESIGNATION
(1)	Circuit Breaker Safety Clips
(2)	Access Platform
Referenced Procedure	

ITEM	DESIGNATION
- 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up
(1)Open, safety and tag the circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors.
(2)Install access platform.

Pre SB GE 72-475

C. Removal
(1)Remove the IGV thru 5th-Stage VSV outer flanged bushing as follows :
(a)Use a felt tip pen to put identification marks on the spacer, the tang of the vane, and the outer diameter of the case.
(b)Slowly loosen the locknut until half of the threads are not engaged with the vane stud.
CAUTION : YOU MUST SAFETY THE VANE VERY CAREFULLY. IF THE VANE FALLS INTO THE CASE, AN ENGINE REMOVAL IS REQUIRED TO REMOVE THE VANE. ENGINE DAMAGE CAN OCCUR.
(c)Carefully lift the lever arm, sleeve, and spacer.
Use lockwire to attach the vane below the spacer.
1 Make the lockwire tight.
(d)Remove the nut, sleeve, lever arm, and the spacer.
(e)Remove the damaged outer flanged bushing.
(2)Remove the IGV through 4th-Stage VSV outer flanged bushings as follows :
(a)Use a felt tip pen to put identification marks on the spacer, the tang of the vane and the outer diameter of the case.
(b)Slowly loosen the locknut until half of the threads are not engaged with the vane stud.
CAUTION : YOU MUST SAFETY THE VANE VERY CAREFULLY. IF THE VANE FALLS INTO THE CASE, AN ENGINE REMOVAL IS REQUIRED TO REMOVE THE VANE. ENGINE DAMAGE CAN OCCUR.
(c)Carefully lift the lever arm, sleeve, and spacer.
Use lockwire to attach the vane below the spacer.
1 Make the lockwire tight.
(d)Remove the nut, sleeve, lever arm, and the spacer.
(e)Remove the damaged outer flanged bushings.

D. Installation
(1)Install the 5th-Stage VSV outer flanged bushing as follows (Ref. Fig. 801) :
(a)Install the outer flanged bushing to the case.
(b)Install the same spacer, sleeve, and the jamnut.
1 Align the identification marks.
(c)Remove the lockwire and TORQUE the jam nut to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).
(d)Install the lever arm and the locknut.
(e)TORQUE the locknut to between 90 and 100 lbf.in. (1.02 and 1.13 m.daN).
(2)Install the IGV thru 4th-Stage VSV outer flanged bushing as follows :

(a)Install the outer flanged bushing as follows :
1 Install the spacer, lever arm, sleeve, and locknut.
2 Align the identification marks.
CAUTION : YOU MUST REPLACE A LOCKNUT IF ITS RUN-ON TORQUE IS LESS THAN 5 LBF.IN. (0.06 M.DAN) OR MORE THAN 40 LBF.IN. (0.45 M.DAN).
DAMAGE TO THE ENGINE CAN OCCUR IF YOU DO NOT REPLACE A LOCKNUT THAT HAS AN INCORRECT RUN-ON TORQUE.
(b)Remove the lockwire and tighten the locknut to run-on torque.
1 If the run-on torque is less than 5 lbf.in. (0.06 m.daN) or more than 40 lbf.in. (0.45 m.daN) replace the nut.
(c)On the 3rd and 4th-stage lever arms, TORQUE the locknut to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).
(d)On IGV, 1st and 2nd-stage lever arms, TORQUE the locknut to between 50 and 60 lbf.in. (0.57 and 0.68 m.daN).
(e)Do a check of the vane assembly to make sure that a small movement is possible.
1 Hold the vane between your thumb and forefinger, and try to move the vane.
2 You must feel a very small movement of the vane.
. If you do not feel a very small movement of the vane, do the steps to install the bushing again.

End Pre SB GE 72-475
Post SB GE 72-475

(3)Install the IGV thru 5th-stage VSV outer flanged bushing as follows :
(a)Install the outer flanged bushing, spacer, lever arm, sleeve, and locknut.
1 Align the identification marks.
CAUTION : YOU MUST REPLACE A LOCKNUT IF ITS RUN-ON TORQUE IS LESS THAN 5 LBF.IN. (0.06 M.DAN) OR MORE THAN 40 LBF.IN. (0.45 M.DAN). DAMAGE TO THE ENGINE CAN OCCUR IF YOU DO NOT REPLACE A LOCKNUT THAT HAS AN INCORRECT RUN-ON TORQUE.
(b)Remove the lockwire and tighten the locknut to run-on torque.
1 If the run-on torque is less than 5 lbf.in. (0.06 m.daN) or more than 40 lbf.in. (0.45 m.daN) replace the nut.
(c)On 5th-Stage lever arms, TORQUE the locknut to between 90 and 100 lbf.in. (1.02 and 1.13 m.daN).
(d)On the 3rd and 4th-stage lever arms, TORQUE the locknut to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).
(e)On IGV, 1st and 2nd-stage lever arms, TORQUE the locknut to between 50 and 60 lbf.in. (0.57 and 0.68 m.daN).
(f)Do a check of the vane assembly to make sure that a small movement is possible.
1 Hold the vane between your thumb and forefinger, and try to move the vane.
2 You must feel a very small movement of the vane.
. If you do not feel a small movement of the vane, do the steps to install the bushing again.

End Post SB GE 72-475

6. Replacement of VSV Actuation Lever

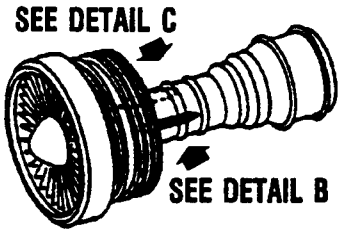
A. Equipment and Materials

ITEM	DESIGNATION
(1)	Access Platform
(2)	Circuit Breaker Safety Clips
(3)Material No.C01-007	Adhesives, Plastics, Sealants (Ref. 70-00-00)
(4)Material No.C04-001	Cleaning Compounds and Solvents (Ref. 70-00-00)
(5)Material No.C05-003	Inspection and Marking Compounds (Ref. 70-00-00)
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up
(1)Open, safety and tag the circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Install access platform.

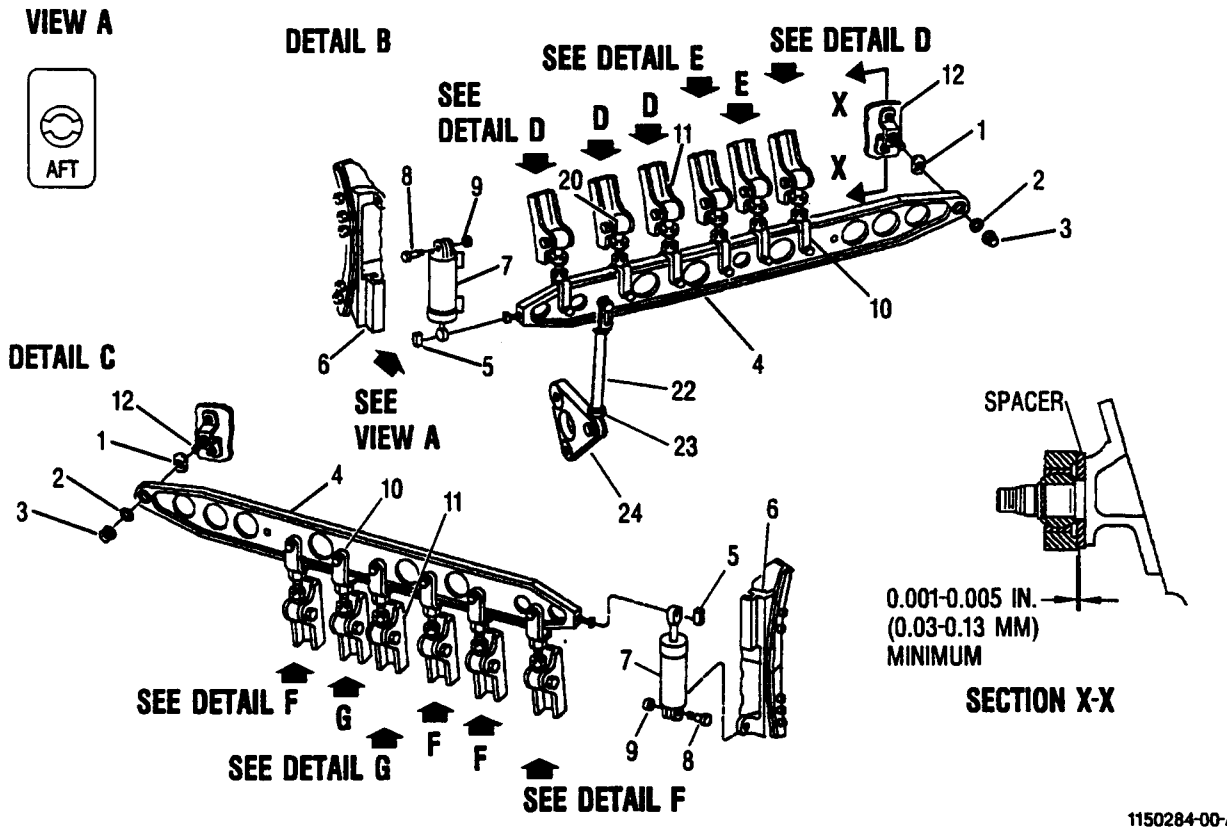
C. Removal (Ref. Fig. 802)
(1)Mark stage numbers on clevis assemblies (10) with C05-003.
(2)If removing the left side lever, first disconnect the feedback pushrod (22) by removing the cotter pin, nut, washer and bolt (23) that connect the feedback pushrod (22) to the feedback bellcrank (24).
CAUTION : RETAIN PUSHROD - ROD-END BEARING LOCKWIRE INTACT. ANY MOVEMENT OR ADJUSTMENT OF THE PUSHROD - ROD-END BEARING LENGTH REQUIRES THAT STAGE-TO-STAGE RIGGING BE CHECKED.
(3)Disconnect the rod end bearings (20) from the connecting links (11) as follows :
(a)Remove the nuts (15), washers (14), bushings (13) (stages 3-4) and bolts (19) from the connecting links (11).
(4)Remove aft mount nut (3), washer (2) and move aft end of actuation lever (4) out to clear actuator lever mount (12). Rotate lever 90 degrees and remove lever from actuator lever guide (5) and actuator (7).
Pre SB GE 72-663
(5)Disconnect rod end bearing (20) and clevis assemblies (10) from actuation lever (4) by removing bolts (16) and nuts (17) which attach clevis assemblies (10) to actuation lever (4).
End Pre SB GE 72-663
Post SB GE 72-663
(5)Disconnect rod end bearing (20) and clevis assemblies (10) from actuation lever (4) as follows :
(a)Remove bolts (16), nuts (17) and dust and moisture seal boots (18) which attach clevis assemblies (10) to actuation lever (4).
End Post SB GE 72-663

D. Installation (Ref. Fig. 802)
Pre SB GE 72-663
(1)Assemble the rod end bearing (20) and clevis assemblies (10) to new actuation lever (4) with bolts (16) and nuts (17). TORQUE nuts to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN).



LEGEND:

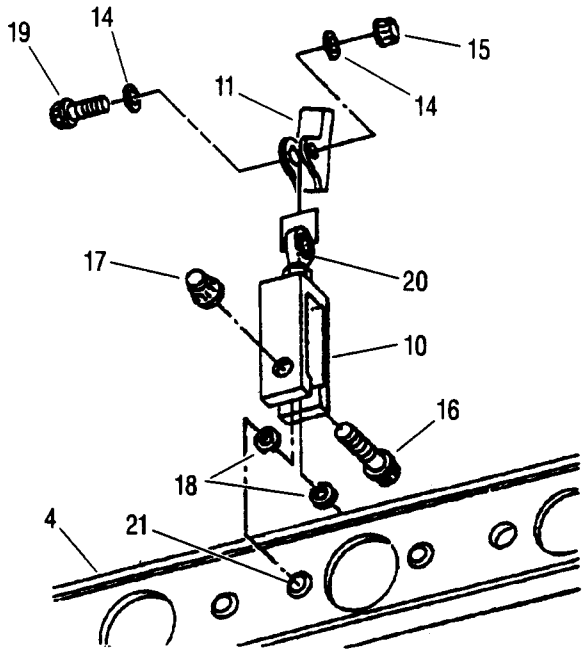
1. SPACER
2. WASHER
3. AFT MOUNT NUT
4. ACTUATION LEVER
5. ACTUATOR LEVER GUIDE
6. BRACKET
7. ACTUATOR
8. BOLT
9. NUT
10. CLEVIS ASSEMBLY
11. CONNECTING LINK
12. ACTUATOR LEVER MOUNT
13. BUSHING
14. WASHER
15. NUT
16. BOLT
17. NUT
18. DUST AND MOISTURE SEAL BOOT
19. BOLT
20. ROD END BEARING
21. LEVER ARM BEARING
22. FEEDBACK PUSHROD
23. COTTER PIN, NUT, WASHER AND BOLT
24. FEEDBACK BELLCRANK



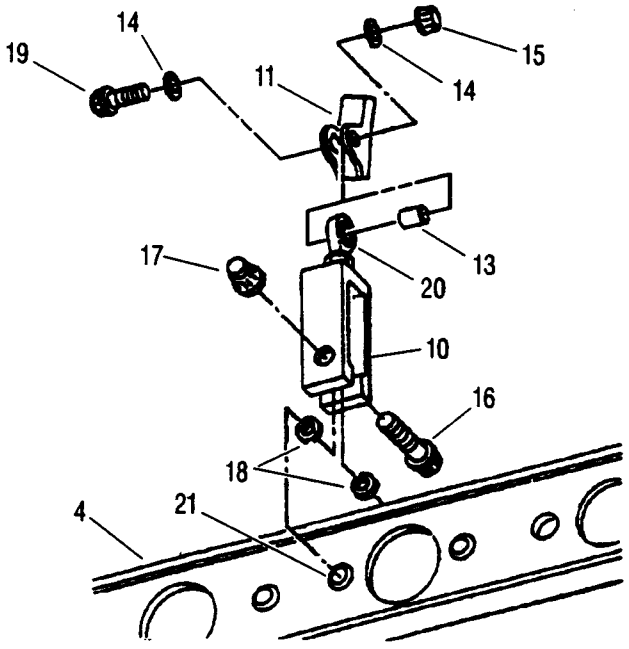
BM5 72 32 00 8 LBMA 00

VSV Actuation Lever Assembly (Sheet 1/3)
Figure 802

DETAIL D
STAGE IGV - 2, STAGE 5



DETAIL E
STAGE 3 - 4

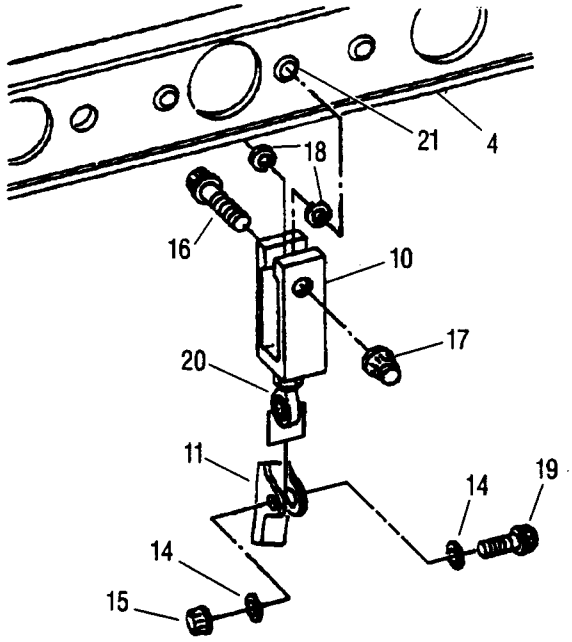


1150285-0(

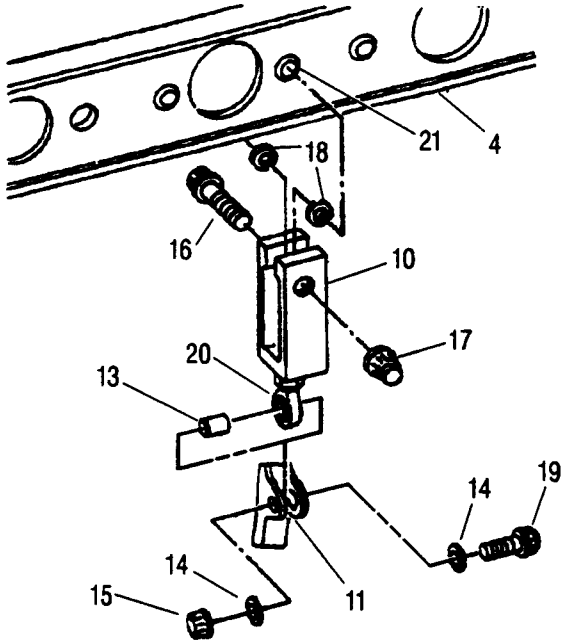
BM5 72 32 00 8 LBMJ 00

VSV Actuation Lever Assembly (Sheet 2/3)
Figure 802

DETAIL F
STAGE IGV - 2, STAGE 5



DETAIL G
STAGE 3 - 4



1150286-0(

BM5 72 32 00 8 LBMS 00

VSV Actuation Lever Assembly (Sheet 3/3)
Figure 802

End Pre SB GE 72-663
Post SB GE 72-663

(1)Assemble the rod end bearing (20) and clevis assemblies (10) to new actuation lever (4) with bolts (16), nuts (17) and dust and moisture seal boots (18). TORQUE nuts to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN).

End Post SB GE 72-663

NOTE : Bolt heads on the pushrod clevis are against the case with one washer under the head and one washer under the nut.

CAUTION : MAKE CERTAIN THAT THE ACTUATOR LEVER GUIDE'S DEEPEST COUNTERBORED SIDE FACES FORWARD AT INSTALLATION. INCORRECT ASSEMBLY MAY CAUSE ACTUATING SYSTEM TO BIND AND CRACKING OF THE ACTUATOR LEVER GUIDE.

(2)Position forward end of actuation lever (4) through uniball of actuator (7), install actuation lever guide (5) on end of lever, rotate 90 degrees, and slide guide into channel of bracket (6).

Pre SB GE 72-658

(3)If it is necessary to replace the spacer (1), install the new spacer (1) as follows :

WARNING : METHYL ETHYL KETONE (MEK) (C04-001) IS FLAMMABLE AND TOXIC TO SKIN, EYES, AND THE RESPIRATORY TRACT. SKIN AND EYE PROTECTION IS NECESSARY. AVOID REPEATED OR PROLONGED CONTACT. USE IN A WELL VENTILATED AREA.

(a)Clean the actuation lever mount (12) with MEK Material No.C04-001 and a soft cloth.

(b)Install the correct spacers (1) to get a clearance of 0.001-0.005 in. (0.03-0.12 mm) between the spacer (1) and the actuation lever (4). Five different spacers are available to get the correct thickness.

(c)Bond the spacer (1) to actuation lever mount (12) with Material No.C01-007.

(d)Clean off unwanted material No.C01-007 with a cloth, if necessary.

NOTE : Material No.C01-007 must cure for a minimum of 8 hours before the spacers are tight. Make sure that the spacers are tight before you accept the engine for service.

(4)Install actuation lever (4) to actuation lever mount (12).

(5)Install washer (2), aft mount nut (3) and TORQUE to between 190 and 230 lbf.in. (2.13 and 2.58 m.daN). Make sure that there is a minimum clearance of 0.001-0.005 in. (0.03-0.12 mm) between the spacer (1) and the actuation lever (4).

End Pre SB GE 72-658
Post SB GE 72-658

(3)If the spacer (1) needs to be replaced, install the new spacer (1) as follows :

WARNING : METHYL ETHYL KETONE (MEK) (C04-001) IS FLAMMABLE AND TOXIC TO SKIN, EYES, AND THE RESPIRATORY TRACT. SKIN AND EYE PROTECTION IS NECESSARY. AVOID REPEATED OR PROLONGED CONTACT. USE IN A WELL VENTILATED AREA.

(a)Clean the actuation lever mount (12) with MEK Material No.C04-001 and a soft cloth.

(b)Install new spacer (1) so the lips face inboard and engage the actuation lever mount (12). See where the spacer (1) contacts the

actuation lever mount (12).
(c)Remove the spacer (1), apply Material No.C01-007 on the spacer (1) where it will touch the actuation lever mount (12).
(d)Install the spacer (1). Be sure the lips on the spacer (1) engage the actuation lever mount (12).
(e)Clean off unwanted Material No.C01-007 with a cloth, if necessary.
NOTE : Material C01-007 must cure for a minimum of 8 hours before the spacers are tight. Make sure that the spacer is tight before you accept the engine for service.
(4)Install actuation lever (4) to actuation lever mount (12).
(5)Install washer (2) and aft mount nut (3) and TORQUE to between 190 and 230 lbf.in. (2.13 and 2.58 m.daN). Make sure that there is a minimum clearance of 0.001-0.005 in. (0.03-0.12 mm) between the spacer (1) and the actuation lever (4).

End Post SB GE 72-658

(6)Install rod-end bearings (20) to actuation ring connecting links (11), IGV through 5th stage, at 3 and 9 o'clock positions as follows :
(a)Install bolts (19), bushings (13) (stages 3-4), washers (14) and nuts (15) to the connecting links (11).
(b)TORQUE bolts for stages IGV, 1 and 2 to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN). TORQUE bolts for stages 3 thru 5 to between 40 and 45 lbf.in. (0.45 and 0.50 m.daN) above maximum installation torque.
(7)Install the feedback pushrod (22) to the feedback bellcrank (24). Install the bolt, washer, and nut (23). TORQUE to between 50 and 85 lbf.in. (0.56 and 0.95 m.daN).
Continue tightening nut until cotter pin holes align, but do not exceed torque of 85 lbf.in. (0.95 m.daN). Install and form cotterpin.

Pre SB GE 72-663

(8)Seal the rod end bearings (20) and the bearings on the VSV actuation lever (4) on stages IGV thru 5 with Material No.C01-007 per paragraph 8.

End Pre SB GE 72-663

Post SB GE 72-663

(8)Seal the rod end bearings (20) on stages IGV thru 5 with Material No.C01-007 per paragraph 8.

End Post SB GE 72-663

7. Replacement of the Slot Loaded Bearing Ball

A. Equipment and Materials

ITEM	DESIGNATION
(1)	Access Platform
(2)	Circuit Breaker and Safety Clips
(3)Material No.C02-004	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
(4)2C7798	Tool Set - Bearing Insert Removal/Installation

Referenced Procedure

ITEM	DESIGNATION
- 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up
(1)Open, safety and tag the circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Install access platform.

C. Removal of Bearing Ball (Ref. Fig. 802)
CAUTION : RETAIN PUSH ROD-ROD END BEARING SAFETY WIRE INTACT. ANY MOVEMENT OR ADJUSTMENT OF THE PUSH ROD-ROD END BEARING LENGTH REQUIRES THAT STAGE TO STAGE RIGGING BE CHECKED.
(1)Disconnect rod end bearing (20) from connecting link (11).
(2)If the feedback pushrod (22) end bearing is being replaced, disconnect the feedback pushrod (22) by removing the cotter pin, nut, washer and bolt (23) which connect the rod end bearing to the feedback bellcrank (24).
(3)Disconnect push rod-rod end bearing-clevis assemblies (10) from actuation lever (4) by removing bolts and nuts which fasten clevis assemblies (10) to actuation lever (4) if required.
PRE GE SB 72-110 *** (VSV ACTUATION LEVER SLOT LOADED BEARINGS WITH INSERTS)
(4)Remove the inserts from slot loaded bearing. Use tool set 2C7798 (Ref. Fig. 803).
END PRE GE SB 72-110
(5)Align bearing ball with loading slots and remove by pushing with finger from the opposite side (Ref. Fig. 804)

D. Installation of Bearing Ball (Ref. Fig. 802)
(1)Clean the outer race and apply Material No.C02-004.
(2)Insert bearing ball through loading slot in outer bearing race. Rotate it to proper position.
PRE GE SB 72-110 *** (VSV ACTUATION LEVER SLOT LOADED BEARINGS WITH INSERTS)
(3)Install the inserts into slot loaded bearing. Use tool set 2C7798 (Ref. Fig. 803).
END PRE GE SB 72-110
(4)Install push rod-rod end bearing-clevis assemblies (10) to actuation lever (4) if removed. TORQUE the nuts to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN).
(5)Install rod end bearing (20) to actuation ring connecting link (11) at 3 or 9 o'clock. TORQUE nut to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN) for IGV and stages 1 and 2. Torque nut to run on torque plus 40-45 lbf.in. (0.45-0.50 m.daN) for stages 3 thru 5.
(6)If the feedback pushrod (22) end bearing was replaced, install the feedback bellcrank (24) to feedback rod end bearing with bolt, washer, and nut (23). Tighten nut to 50 lbf.in. (0.56 m.daN). Continue tightening nut until cotter pin holes align, but do not exceed torque of 85 lbf.in. (0.96 m.daN). Install and form cotter pin.

Pre SB GE 72-663

(7)Seal the rod end bearings (20) and the bearings on the VSV actuation lever (4) on stages IGV thru 5 with Material No.C01-007 per paragraph 8.

End Pre SB GE 72-663

Post SB GE 72-663

(7)Seal the rod end bearings (20) on stages IGV thru 5 with Material No.C01-007 per paragraph 8.

End Post SB GE 72-663

8. Repair of the Slot Loaded Bearing with RTV

A. Equipment and Materials

ITEM	DESIGNATION
(1)	Access Platform
(2)	Circuit Breaker and Safety Clips
(3)Material No.C01-007	Adhesives, Plastics, Sealants (Ref. 70-00-00)
(4)Material No.C04-001	Cleaning Compounds and Solvents (Ref. 70-00-00)
(5)Material No.C04-030	Cleaning Compounds and Solvents (Ref. 70-00-00)
(6)Material No.C10-013	Miscellaneous (Ref. 70-00-00)
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up

(1)Open, safety and tag the circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

(2)Install access platform.

C. Repair (Ref. Fig. 802)

Pre SB GE 72-663

(1)Seal the rod end bearings (20) and the bearings on the VSV actuation lever (4) on stages IGV thru 5 with Material No.C01-007 as follows :

End Pre SB GE 72-663

Post SB GE 72-663

(1)Seal the rod end bearings (20) on stages IGV thru 5 with Material No.C01-007 as follows :

End Post SB GE 72-663

(a)Clean the areas on all sides of the bearings with Material No.C04-030 or C04-001. Remove all dirt, oil, and grease.

(b)Spray the surfaces that will come in contact with the RTV with Material No.C10-013.

Pre SB GE 72-663

(c)Seal the areas between the rod end bearings and the actuation lever arm bearings with a fillet of Material No.C01-007. It is recommended that the build-up of the sealant be less than 0.250 in. (6.35 mm).

End Pre SB GE 72-663

Post SB GE 72-663

(c)Seal the areas between the rod end bearings with a fillet of Material No.C01-007. It is recommended that the build-up of sealant be less than 0.250 in. (6.35 mm).

End Post SB GE 72-663

(d)Let the RTV sealant cure for a minimum of 12 hours.

NOTE : Cure times are based on a room temperature of 77°F (25°C) with 50 percent relative humidity. Higher temperatures and humidity will make the process faster ; lower temperatures and humidity will slow the process.

D. Close-Up

(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(2)Remove access platform.

(3)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301). Remove safety clips and tags close circuit breakers.

9. Replacement of VSV Clevis Assembly

A. Equipment and Materials

ITEM	DESIGNATION
(1)	Circuit Breaker Safety Clips
(2)	Access Platform
(3)2C6925	Set Gage-VSV Clevis Assembly
(4)Material No.C05-003	Inspection and Marking Compounds (Ref. 70-00-00)
(5)Material No.C10-071	Miscellaneous (Ref. 70-00-00)
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up

(1)Open, safety and tag the circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

(2)Install access platform.

NOTE : This procedure is for clevis assemblies at stages 1 thru 5.

C. Removal of Variable Stator Vane (VSV) Clevis Assembly (Ref. Fig. 805, 806)

(1)Mark on each clevis with Material No.C05-003 to show the stage numbers.

(2)Remove the nut (3), two washers (4), bushing (12) (if installed), and bolt (5) from the connection link (6). Remove the rod-end bearing (1) from the connection link (6).

Pre SB GE 72-663

(3)Remove the nut (7), and bolt (8) from the clevis (9).

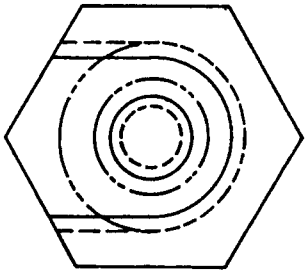
End Pre SB GE 72-663

Post SB GE 72-663

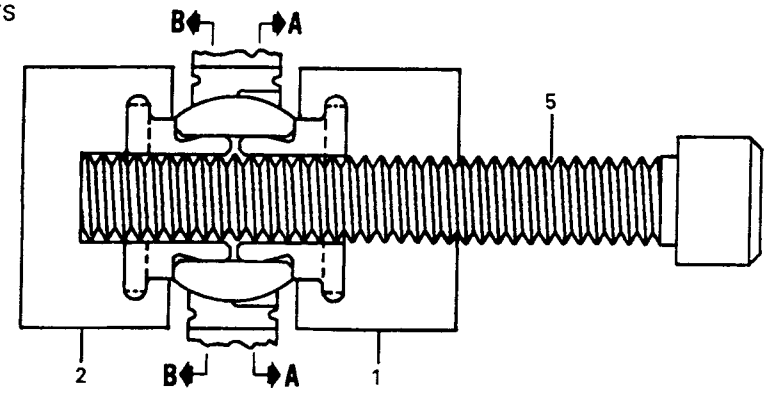
(3)Remove the nut (7), bolt (8) and the two dust and moisture seal boots (10) from the clevis (9).

End Post SB GE 72-663

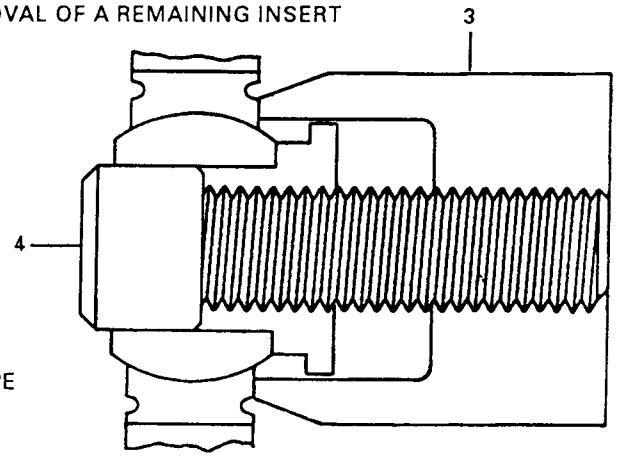
REMOVAL OF ONE OR BOTH INSERTS



SECTION A - A OR B - B



REMOVAL OF A REMAINING INSERT

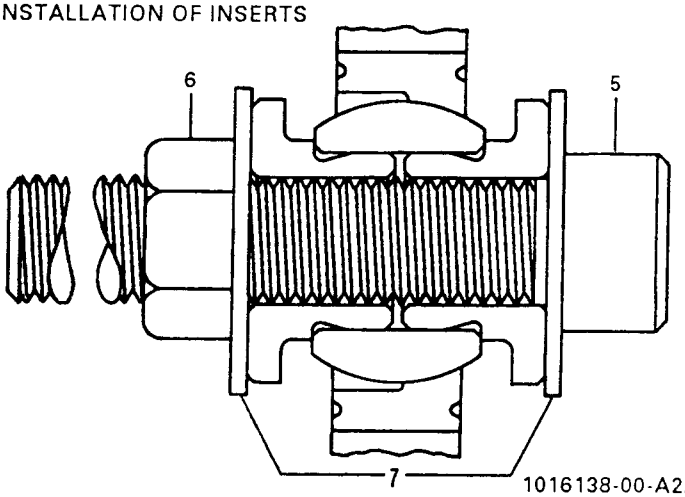


LEGEND :

1. BLOCK-THREADED
2. BLOCK-PILOTED
3. BLOCK-RELIEVED
4. SCREW-SPECIAL HEX SOCKET HD.
5. SCREW 0.250-20 UNC X 1.75 (44.5 MM) LG. THREADED WITHIN 0.18 (4.6 MM) OF HEAD-HEX SOCKET HEAD TYPE
6. HEX NUT 0.250-20 UNC THREAD
7. WASHER PLAIN 0.250 (6.35 MM) NOMINAL SIZE

NOTE :
ALL DIMENSIONS GIVEN IN INCHES WITH METRIC UNITS IN PARENTHESES

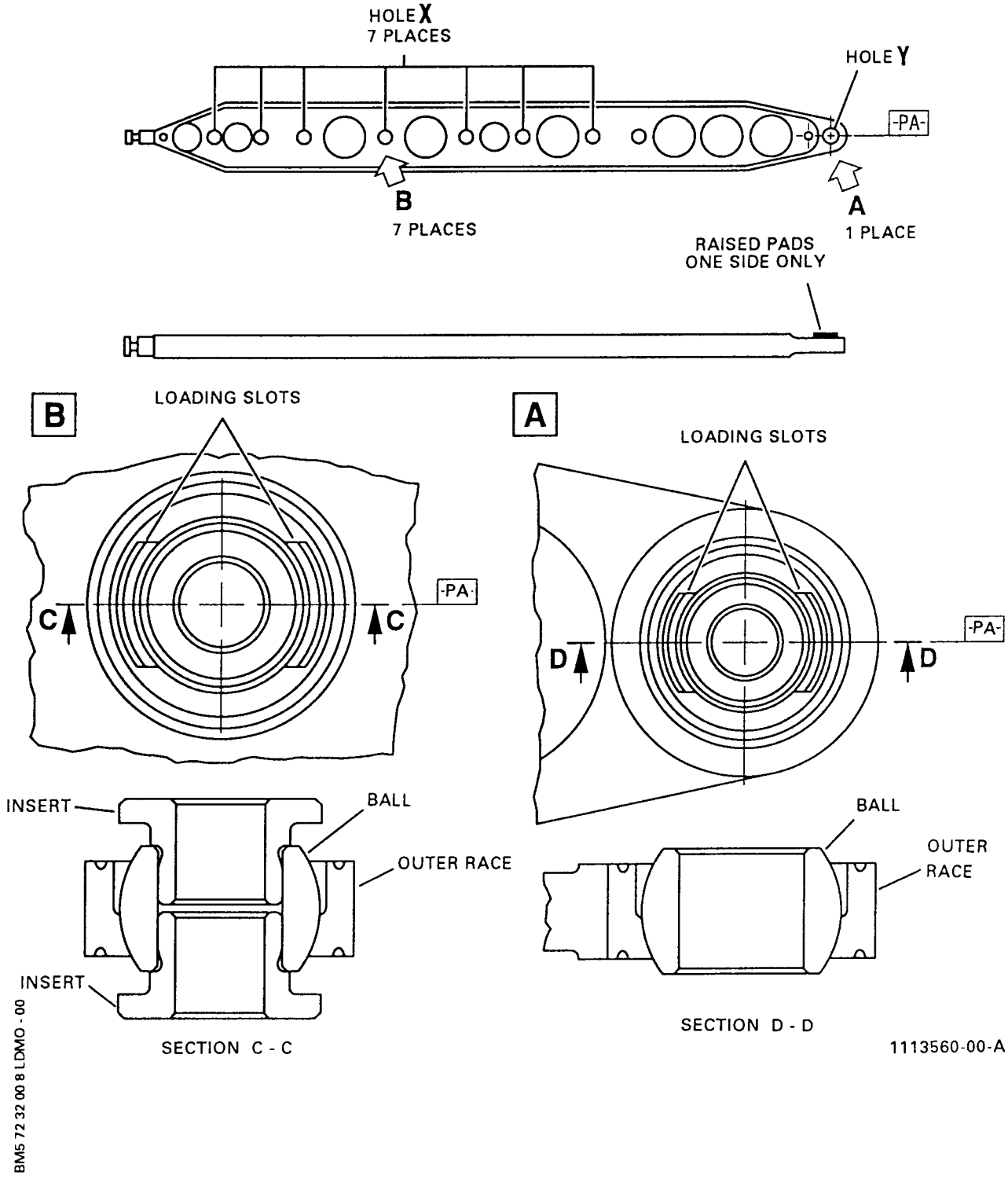
INSTALLATION OF INSERTS



1016138-00-A2A

BM5 72 32 00 8 LCMO - 00

VSV Actuation Lever Slot Loaded Bearing
Insert Using Tool 2C7798
Figure 803



VSV Actuation Lever Slot Loaded Bearing
Figure 804

(4)Replace the worn components of the VSV clevis assembly, or get a serviceable VSV clevis assembly.

D. Installation of Variable Stator Vane (VSV) Clevis Assembly
(Ref. Fig. 805, 806, 807)
CAUTION : YOU MUST KNOW THE CORRECT AERO CONFIGURATION OF THE ENGINE BEFORE YOU DO THIS PROCEDURE.
(1)Pre-set the VSV clevis assembly length. Use the set gage 2C6925. Adjust the length of each clevis assembly to the dimension shown in the VSV clevis assembly pre-set Table 1.

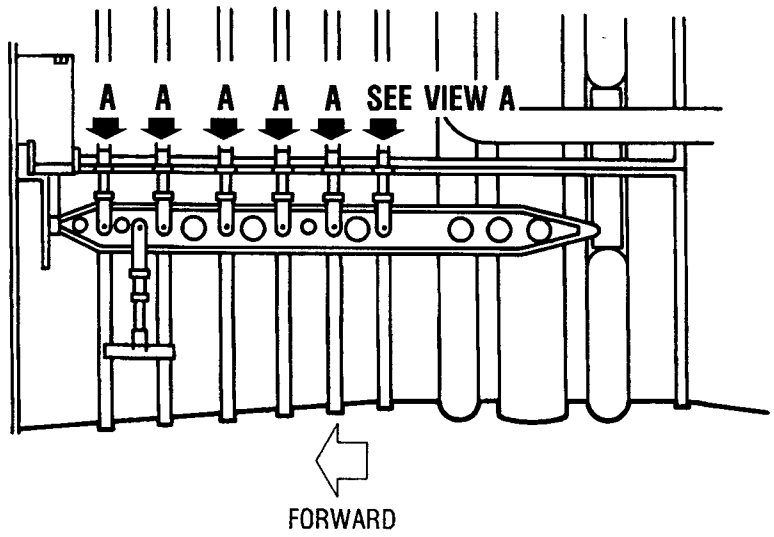
	VSV Clevis Assembly Pre-set Length	
Stage	Phase 0 Aero Pre SB GE 72-272	Phase 1 Aero Post SB GE 72-272
	INCH/(MM)	INCH/(MM)
1	3.696 (93.88)	3.696 (93.88)
2	3.646 (92.61)	3.646 (92.61)
3	3.629 (92.18)	3.629 (92.18)
4	3.626 (92.10)	3.626 (92.10)
5	3.687 (93.65)	3.793 (96.34)

VSV Clevis Assembly Pre-set Lengths
Table 1

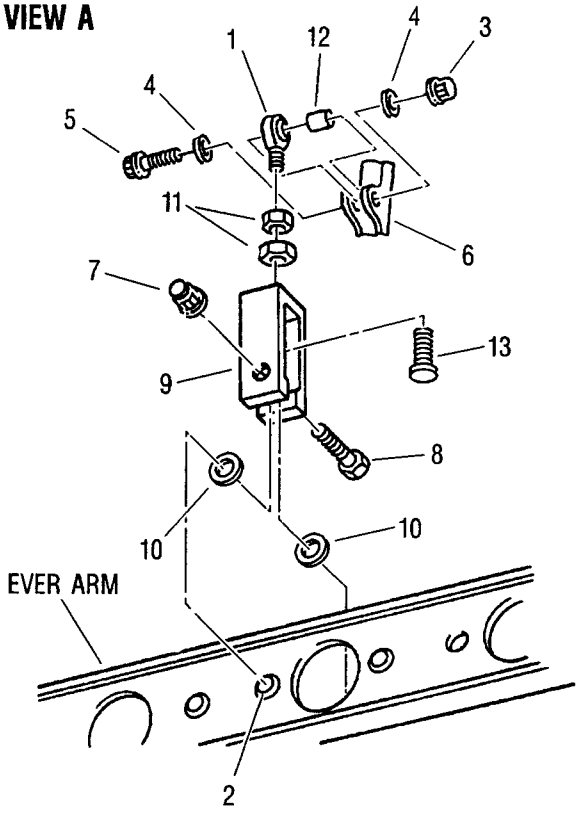
(2)TORQUE the jamnuts (11) to between 70 and 80 lbf.in. (0.79 and 0.90 m.daN).
(3)Safety the clevis assembly with Material No.C10-071 to make sure that the jamnuts do not loosen in operation.

Pre SB GE 72-663
(4)Attach the clevis assembly (9) to the lever arm. Install the bolt (8) with head next to the engine and nut (7). TORQUE the nut to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN).
End Pre SB GE 72-663
Post SB GE 72-663
(4)Attach the clevis assembly (9) to the lever arm. Install the two dust seal boots (10), bolt (8), with head next to the engine and nut (7). TORQUE the nut to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN).
End Post SB GE 72-663
(5)Attach the rod-end bearing (1) to the connection link with the bolt (5), bushing (12) (if necessary), two washers (4) and nut (3).
(6)For stages 1 and 2, TORQUE the nut (3) to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN). For stages 3 thru 5, TORQUE the nut (3) to between 40 and 45 lbf.in. (0.45 and 0.50 m.daN).

LEFT SIDE VIEW



VIEW A



BM5 72 32 00 8 LFM0 00

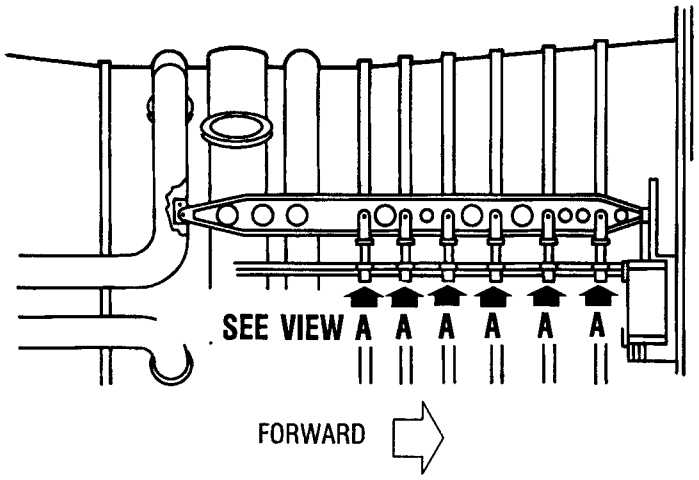
LEGEND:

1. ROD-END BEARING
2. LEVER ARM SLOT LOADED BEARING
3. NUT
4. WASHER
5. BOLT
6. CONNECTION LINK
7. NUT
8. BOLT
9. CLEVIS
10. DUST AND MOISTURE SEAL BOOT
11. JAM NUTS
12. BUSHING
13. PUSHROD

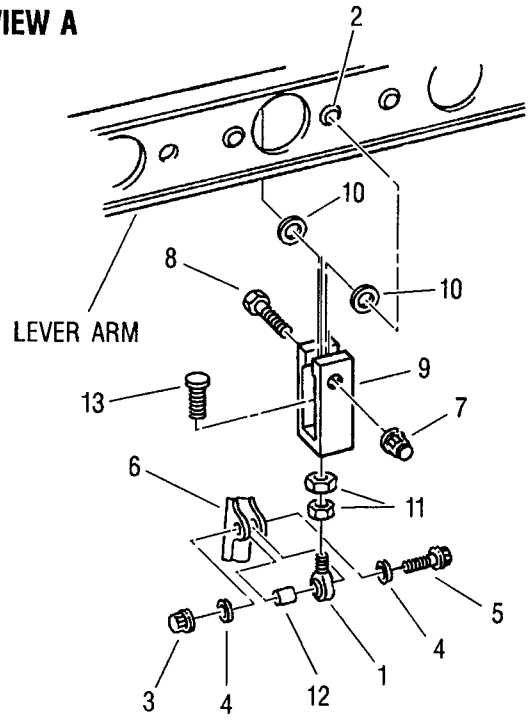
1144096-00-A

Variable Stator Vane Clevis Assembly
Figure 805

RIGHT SIDE VIEW



VIEW A



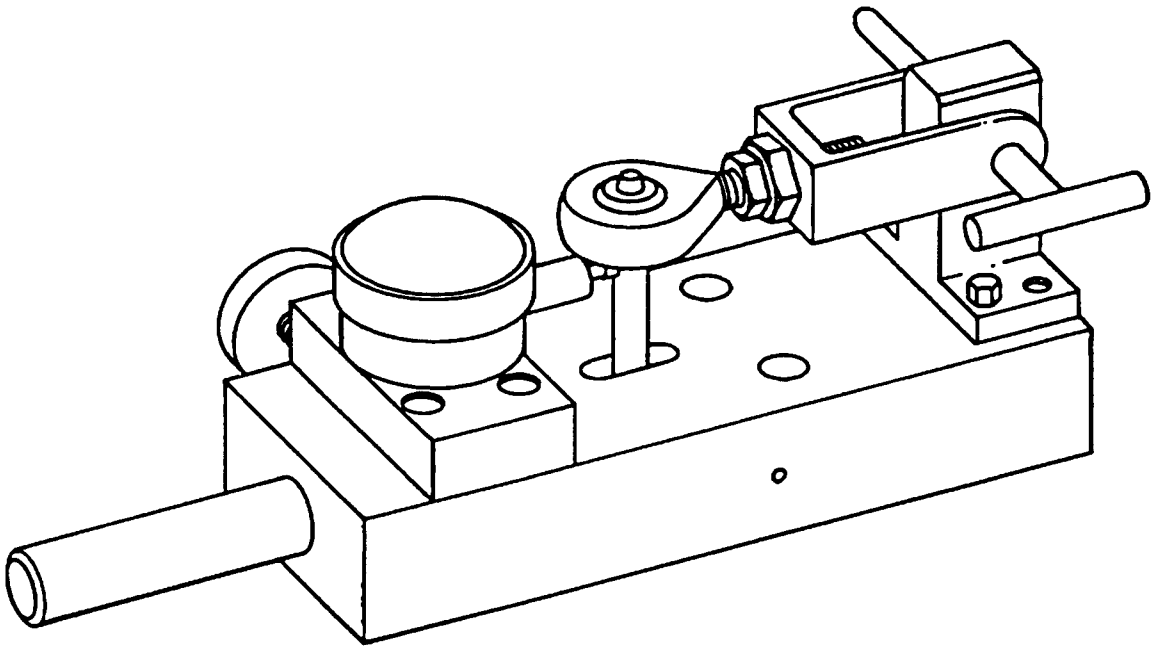
LEGEND:

1. ROD-END BEARING
2. LEVER ARM SLOT LOADED BEARING
3. NUT
4. WASHER
5. BOLT
6. CONNECTION LINK
7. NUT
8. BOLT
9. CLEVIS
10. DUST AND MOISTURE SEAL BOOT
11. JAM NUTS
12. BUSHING
13. PUSHROD

BM5 72 32 00 8 LHMO 00

1144099-00-A

Variable Stator Vane Clevis Assembly
Figure 806



BM5 72 32 00 8 LJM0 00

1143821-00-A

Set Gage 2C6925 - Pre-set Length of Clevis Assembly
Figure 807

E. Close-Up
(1)Make sure that work area is clean and clear of tools and miscellaneous items of equipment.
(2)Remove access platform.
(3)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301). Remove safety clips and tags and close circuit breakers.

10.Replacement of Connecting Links

A. Equipment and Materials

ITEM	DESIGNATION
(1)	Access Platform
(2)	Circuit Breaker and Safety Clips
(3)Material No.C02-001	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
(4)Material No.C02-058	Anti-Seize Compounds, Lubricants, Oils (GE Spec A50TF201 Class A)
(5)	Corrosion Resistant Steel Lockwire (Ref. 70-00-00)
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up
(1)Open, safety and tag the circuit breakers for the applicable engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Install access platform.

C. Removal (Ref. Fig. 808)
NOTE : Use this procedure to remove the connecting links at stage 5.
(1)Remove the stage 5 connecting links from the actuation ring segments as follows :
(a)Remove the 4 bolts that attach each connecting link to the actuation ring upper and lower segments. Tag the connecting links to identify the stage.
(b)Remove 4 sleeves from each connecting link.
(c)If any sleeve shows visible signs of wear, discard the sleeve.
NOTE : Use this procedure to remove the connecting links at stage IGV through stage 4.
(2)Remove the stages IGV through 4 connecting links from the actuation ring segments as follows :
(a)Remove 4 bolts and 4 washers that attach each connecting link to the actuation ring upper and lower segments. Tag the connecting links to identify the stage.
(b)Remove 2 straight pins from each connecting link.
(c)Remove 2 sleeves from each connecting link.
(d)If any sleeve shows visible signs of wear, discard the sleeve.

D. Installation (Ref. Fig. 808)
NOTE : Use this procedure to install the stage IGV through stage 4

connecting links.

(1)Install the stages IGV through 4 connecting links as follows :

(a)Install 2 straight pins through each connecting link.

(b)Install 2 sleeves through the back of each connecting link.

(c)Install the correct stage connecting link to the correct stage actuation ring upper and lower segment as follows :

1 Lubricate the threads and washer faces of bolts with Material No. C02-001 or Material No.C02-058.

NOTE : Each connecting link is stamped with the words FWD SIDE. This side must face forward.

2 Align the actuating ring upper and lower segments with the connecting link straight pins. Connecting link side stamped FWD SIDE must face forward.

CAUTION : THE VANE ACTUATION ARM PINS MUST NOT ENGAGE THE LIGHTENING POCKETS OF THE CONNECTING LINKS.
DAMAGE TO THE ENGINE COULD OCCUR.

3 Align vane actuation arms with sleeves in connecting link. Attach the vane actuation ring upper and lower segments to connecting link with 4 bolts and 4 washers.

4 TORQUE the bolts to between 65 and 75 lbf.in. (0.74 and 0.84 m.daN) and wirelock.

NOTE : Use this procedure to install the stage 5 connecting links.

(2)Install the stage 5 connecting links as follows :

(a)Install 4 sleeves through the back of each connecting link.

(b)Install the connecting link of the actuation ring upper or lower segment as follows :

1 Lubricate the threads and washer faces of bolts with Material No.C02-001 or Material No.C02-058.

CAUTION : THE VANE ACTUATION ARM PINS MUST NO ENGAGE THE LIGHTENING POCKETS OF THE CONNECTING LINKS.
DAMAGE TO THE ENGINE COULD OCCUR.

NOTE : Each connecting link is stamped with the words FWD SIDE. This side must face forward.

2 Align vane actuation arms with sleeves in connecting link. Connecting link side stamped FWD SIDE must face forward.

3 Attach the vane actuation ring upper and lower segments to connecting link with 4 bolts.

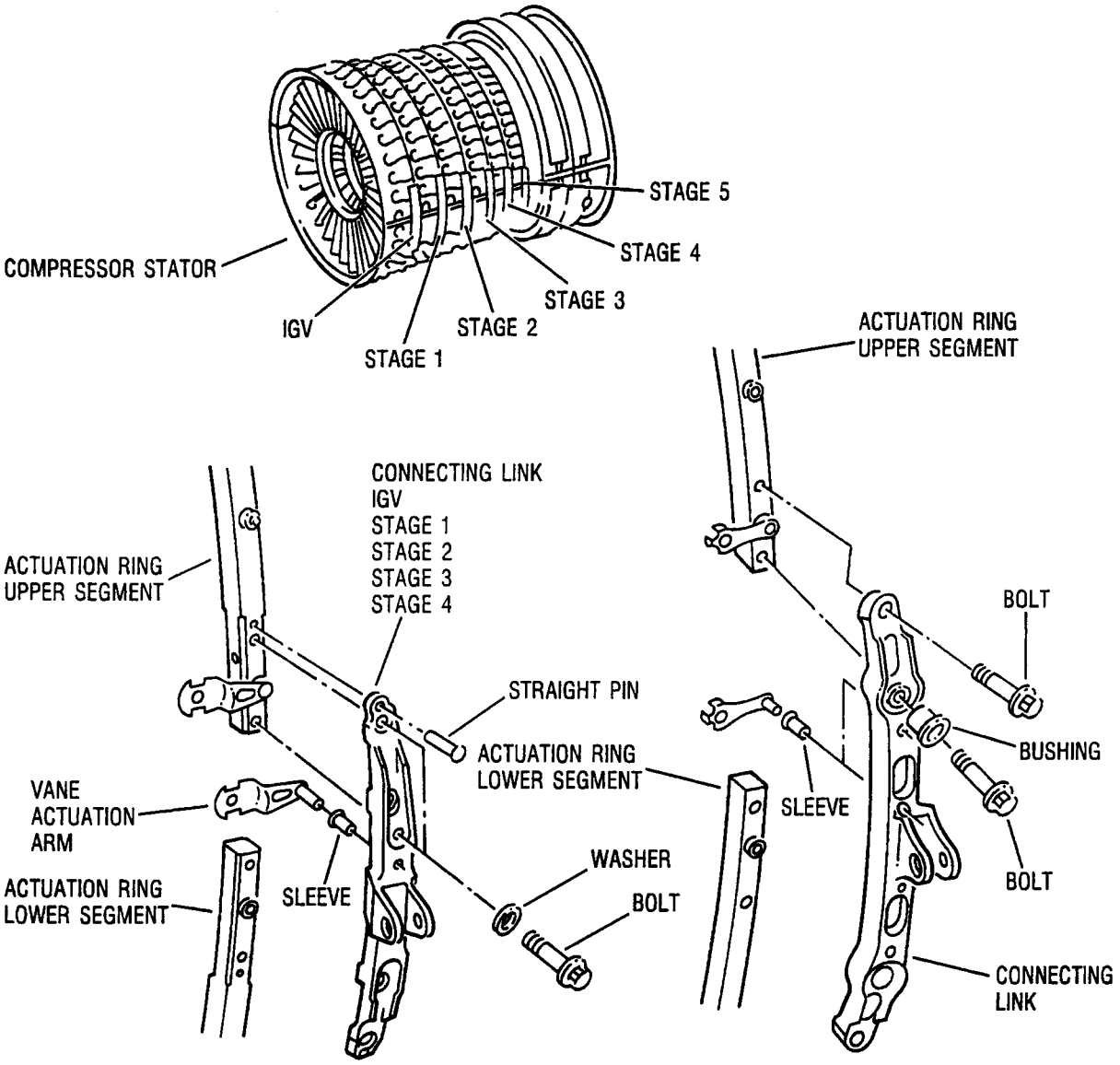
4 TORQUE the bolts to between 65 and 75 lbf.in. (0.74 and 0.84 m.daN) and wirelock.

E. Close-Up

(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(2)Remove access platform.

(3)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301). Remove safety clips and tags, close circuit breakers.



BM5 72 32 00 8 LKM0 00

VSV Connecting Links
Figure 808

COMPRESSOR REAR FRAME ASSEMBLY - INSPECTION/CHECK

1. General

Maintenance of the compressor rear frame (CRF) is limited to the external areas when the engine is installed. Those items which are accessible are covered in this section.

2. Equipment and Materials

ITEM	DESIGNATION
A. Material No.C02-058	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
Referenced Procedures	
- 71-00-00, P. Block 401	Power Plant - General
- 71-00-00, P. Block 501	Power Plant - General
R - 72-41-00, P. Block 601	Combustion Chamber Assembly
- 72-00-00, P. Block 601	Engine-General
- 72-34-00, P. Block 801	Compressor Rear Frame Assembly

3. Visual Inspection/Check

A. Visually inspect the compressor rear frame for the following. Confirm suspected cracks using fluorescent-penetrant inspection. (Ref. Fig. 601).

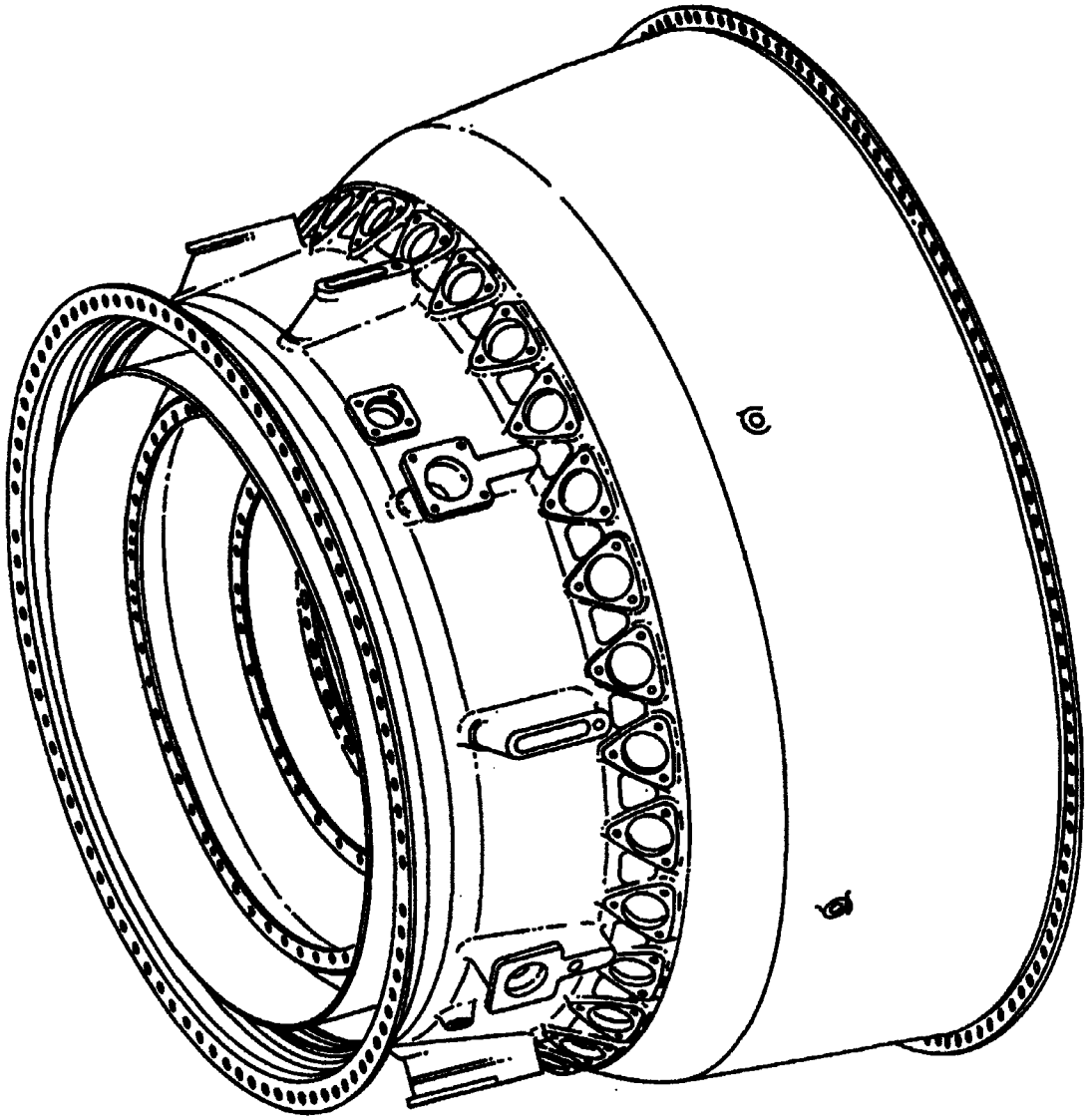
INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(1)Frame Outer Forward Flange for :		
(a)Weld cracks	Any number to 0.06 in. (1.5 mm) in the axial direction and to 0.10 in. (2.5 mm) transverse to the weld with minimum spacing of 0.5 in. (13 mm), are acceptable.	
(b)Bolt hole radial cracks	Not serviceable	(Ref. 72-00-00, P. Block 601) for Over-Serviceable-Limit-Extensions
(2)Frame Outer Rear Flange for :		
(a)Bolt hole radial cracks	One per hole, four per flange radially outward only. Cracks inward toward casing not allowed	
(b)Loose bolts	Not serviceable	Remove bolt(s). Inspect flange as indicated

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
		below, (2) (c). Reinstall bolt(s) if flange is serviceable. Apply thread lube Material No.C02-058 and TORQUE bolt(s) to between 200 and 210 lbf.in. (2.26 and 2.37 m.daN)
(c)Wear on the forward face of aft flange under loose bolt(s) (bolt removed)	Any amount provided bolt head completely covers hole to seal air leakage ; maximum of two nonadjacent hole locations allowed	
(d)Nicks, scores and scratches	Any number, any length, 0.03 in. (0.8 mm) deep, after removal of high metal, that do not extend across more than 75 % of flange sealing surface	
(3)Frame Outer Case Mid Rings for :		
(a)Cracks	Not serviceable if into skin	
(b)Fretting	70 % of tee section 0.01 in. (0.3 mm) deep. 20 % of tee section surface 0.03 in. (0.8 mm) deep	
(4)Outer Casing for :		
(a)Cracks in parent metal	Not serviceable	
(b)Weld cracks	Any number to 0.06 in. (1.5 mm) in the axial direction and to 0.10 in. (2.5 mm) transverse to the weld with a minimum spacing of 0.5 in. (13 mm) are acceptable	
(c)Dents	Any number smooth contour dents 0.250 in. (6.35 mm) deep	

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(d)Nicks, scores and scratches	Any number in axial direction 0.015 in. (0.38 mm) deep, 1 in. (25.4 mm) long, in circumferential direction 0.030 in. (0.76 mm) deep, 1 in. (25.4 mm) long with a minimum separation of 1 in. (25.4 mm) after removal of high metal, provided metal is not reduced to less than 75 % of original thickness	
CAUTION : HOT SPOTS AND BULGES ON OUTER CASING INDICATE A DAMAGED COMBUSTION LINER. A BORESCOPE INSPECTION IS REQUIRED TO DETERMINE THE EXTENT OF DAMAGE. REMOVE THE PLUGS FROM THE 6 BORESCOPE FORWARD ACCESS PORTS IN THE COMPRESSOR REAR FRAME. FOR REMOVAL AND INSTALLATION, (REF. 72-00-00, P. BLOCK 601).		
(e)Hot spots (discoloration)	Any number provided metal is not crazed. No cracks allowed	
(f)Bulges	No cracks allowed. Perform combustor borescope inspection (Ref. 72-41-00, P. Block 601).	
(g)Corrosion	Any amount, provided metal is not reduced to less than 75 % of original thickness	
(5)All Pads for :		
(a)Nicks, scores and scratches	Any number on sealing surface, 0.030 in. (0.76 mm) deep not extending across more than 1/2 the sealing surface after removal of high metal	
(b)Thread damage (except fuel nozzle pad)	Damage totaling 1 thread after chasing thread	Chase thread or repair (Ref. 72-34-00, P. Block 801)
(c)Thread damage fuel nozzle pad	Damage totaling 1 thread after chasing thread	
(d)Cracks	Not serviceable	

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(6)Borescope Ports for :		
(a)Damaged threads	Not serviceable. One full thread may be removed if remaining threads are not damaged	Repair (Ref. 72-34-00, P. Block 801)
(7)Strut Pads for :		
(a)Cracks	Any amount in strut ends that does not permit air leakage. One bolt hole per flange may be cracked through radially outward	
(b)Nicks and scratches	Any number, any length 0.060 in. (1.52 mm) deep after removal of high metal, provided metal is not reduced to less than 75 % of original thickness	
(c)Dents	Any number smooth contour dents 0.250 in. (6.35 mm) deep except on mating surfaces	
(d)Oil wetting or coke	Any amount is serviceable if engine oil use is within limits (Ref. 71-00-00, P. Block 501).	If engine oil use is more than the limits (Ref. 71-00-00, P. Block 501), do a borescope inspection of the CRF (Ref. 72-00-00, P. Block 601). If oil leakage is from the oil impingement manifold, replace the engine within 10 flight cycles (Ref. 71-00-00, P. Block 401). If oil leakage is from the oil supply the tube, replace the engine (Ref. 71-00-00, P. Block 401).
(8)Oil Supply and Scavenge Tubes for :		
(a)Cracks	Not serviceable	

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(b)Nicks and scratches	Any number 0.010 in. (0.25 mm) deep after removal of high metal	
(c)Dents	Any number smooth contour dents 0.060 in. (1.52 mm) deep	
(d)Strut end wear sleeve wear		
1 Oil supply tubes	0.012 in. (0.30 mm) maximum	
2 Scavenge tubes	0.015 in. (0.38 mm) maximum	
3 Sump pressurization tube	0.016 in. (0.41 mm) maximum	
4 Sump vent tube	Not serviceable.	



1025140-01-A

BM5 72 34 00 6 LAMO - 01

Compressor Rear Frame
Figure 601

COMPRESSOR REAR FRAME ASSEMBLY - APPROVED REPAIRS

1. General

A. Maintenance of the compressor rear frame assembly is limited to the external areas.

B. Any usable parts removed, except bolts and nuts, should be temporarily matchmarked or numbered for assembly in original alignment and position.

C. Key-locked inserts with the same internal thread as the original hole, may be used to repair damaged threaded holes which have sufficient remaining wall thickness. Primarily, these inserts are designed for use on parts to provide strong, wear-resistant threads in relatively soft materials, thus improving reliability and repairability. Key-locked inserts (Keen-Serts) (Tridair Industries, Torrance, CA 90505) can be replaced when damaged or otherwise unserviceable. Because the inserts are locked in place by Keys rather than by tightness of fit, enlargement of the hole in the basic casting is minimized ; therefore, the use of oversized inserts for replacement is not required.

2. Repair External Tube Flanges, Vertical Rings, Outer Casing, and Damaged Threads

CAUTION : **BEFORE WORKING ON, OR REPLACING DAMAGED THREAD OR INSERTS ON ANY ASSEMBLED ENGINE, PRECAUTIONS MUST BE TAKEN TO BE SURE THAT MACHINING OR THREAD CHIPS DO NOT FALL INSIDE THE COMPRESSOR REAR FRAME.**

A. Remove high metal from external tube flanges, vertical rings and outer casing.

B. Chase threads as required to repair thread damage.

3. Installation of Key-Locked Inserts

A. Equipment and Materials (Ref. Fig. 801, 802)

CAUTION : **BEFORE WORKING ON, OR REPLACING DAMAGED THREADS OR INSERTS ON ANY ASSEMBLED ENGINE, PRECAUTIONS MUST BE TAKEN TO BE SURE THAT MACHINING OR THREAD CHIPS DO NOT FALL INSIDE THE COMPRESSOR REAR FRAME.**

B. Insert Replacement Procedure

(1)Remove old insert as follows :

(a)Drill out insert, using a drill of the size specified in the Insert Removal Data column (Ref. Fig. 801). Drill to the depth shown in the adjacent column.

(b)Using a small punch, drive the insert locking keys inward and break them off.

(c)Select a standard screw extractor of the proper size, tap it gently into the drilled out hole and remove the old insert.

(d)Clean out threaded hole to remove chips and dirt. Be sure that

KEENSERT REPLACEMENT DATA					INSTALLATION DATA	
INSERT THREAD SIZE			REMOVAL DATA			
INTERNAL	EXTERNAL	INSERT LENGTH (NOM)	DRILL DIA.	DRILL DEPTH	BROACH*	INSTALLATION TOOL*
10-32	5/16-18	0.312	7/32	5/32	B-272-2	TD1032L
10-32	3/8-16	0.312	9/32	1/8	B-332-2	THD1032L
1/4-28	3/8-16	0.375	9/32	3/16	B-332-2	TD428L
1/4-28	7/16-20	0.175	11/32	3/16	B-397-2	THD428L
1/4-28	7/16-14	0.375	11/32	3/16	B-397-2	THD428L
5/16-24	7/16-14	0.437	11/32	3/16	B-397-2	TD524L
5/16-24	1/2-13	0.437	13/32	3/16	B-453-4	THD524L
3/8-24	1/2-13	0.500	13/32	3/16	B-453-4	TD624L
3/8-24	9/16-12	0.500	15/32	3/16	B-516-4	THD624L
7/16-20	9/16-12	0.562	15/32	3/16	B-516-4	TD720L
7/16-20	5/8-11	0.625	17/32	3/16	B-578-4	THD720L
1/2-20	5/8-11	0.625	17/32	3/16	B-578-4	TD820L
1/2-20	11/16-11NS	0.688	19/32	3/16	B-641-4	THD820L

* TOOLS AVAILABLE FROM TRIDAIR INDUSTRIES : FASTENER DIVISION, TORRANCE, CALIF 30505

BM5 72 34 00 8 LAMO 14 09
DM5

CF8-6189-00-C

Keen-Sert Replacement Data
Figure 801

STANDARD KEENSERT PART NUMBER
LIGHT WEIGHT SERIES – NON SELF LOCKING

INSERT PART No.	MS NUMBER	NAS NUMBER	THREAD SIZE		INSERT LENGTH (NOM)
			INTERNAL CLASS 3B	EXTERNAL CLASS 2A	
KN1032	MS51830-201	NAS1394C-3	10-32	5/16-18	0.312
KN428	MS51830-202	NAS1394C-4	1/4-28	3/8-16	0.375
KN524	MS51830-203	NAS1394C-5	5/16-24	7/16-14	0.437
KN624	MS51830-204	NAS1394C-6	3/8-24	1/2-13	0.500
KN720	MS51830-205	NAS1394C-7	7/16-20	9/16-12	0.562
KN820	MS51830-206	NAS1394C-8	1/2-20	5/8-11	0.625

NOTE :
STANDARD MATERIAL : 303 CORROSION RESISTANT STEEL ALTERNATE MATERIALS & LENGTHS AVAILABLE FROM MANUFACTURER.

BM5 72 34 00 8 LBMO 14 09
DM5

CF8-6190-00-C

Standard Keen-Sert Part Numbers
Figure 802

locking key slots are clear of chips or burrs, by using a pick, scriber or other small tool as required. The specific broaching tool listed under Installation Tools, may be used to clean out slots if necessary (Ref. Fig. 801).

(e) If the part is to be rebroached, select the proper broaching tool (Ref. Fig. 801). Position the tool through the threaded hole until seated, using a ball-peen hammer.

(2) Install a replacement insert in the following manner :

(a) Select a replacement insert of the same size as the one removed. Hand start the insert into the threaded hole.

(b) Using the appropriate installation tool (Ref. Fig. 801), screw insert in as far as keys or knurled end of thread permits. Align locking keys with broached slots. Be sure that the top of the insert is below the surface of the surrounding metal ; if it is not, remove insert and countersink hole to permit an additional half-turn of the inserts. As an alternative, new slots can be broached 90 degrees from the existing slots if metal thickness is adequate.

(c) Press in or drive in locking keys as far as tool permits, using the installation tool and an 8-ounce ball-peen hammer or an arbor press.

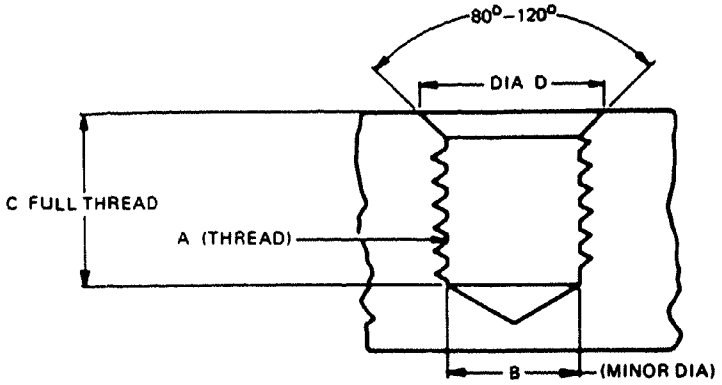
D. Threaded Hole Repair

(1) Select a standard insert which has the same internal thread as the original tapped hole from figure 802, or as specified by inspection/check procedure.

(2) Drill and tap hole to accept insert per the machining requirements (Ref. Fig. 803).

(3) Select proper broach (Ref. Fig. 801), and drive the tool through the threaded hole until seated, using a ball-peen hammer.

(4) Install insert per paragraph 3. B. (2).



INSERT THREAD SIZE		INSERT LENGHT NOM	A THREAD (MIL–S–7742)	B		C	D	
INTERNAL	EXTERNAL			MIN.	MAX.	MIN.	MIN.	MAX.
10–32	5/16–18	0.312	0.3125–18UNC–2B MOD	0.271	0.276	0.37	0.323	0.333
10–32 1/4–28	3/8–16	0.312 0.375	0.375–16UNC–2B MOD	0.331	0.336	0.37 0.43	0.385 0.385	0.395 0.395
1/4–28	7/16–20	0.175	0.4375–20UNF–2B MOD	0.405	0.410	0.23	0.44	0.48
1/4–28 5/16–24	7/16–14	0.375 0.437	0.4375–14UNF–2B MOD	0.396	0.401	0.43 0.50	0.447 0.447	0.457 0.457
5/16–24 3/8–24	1/2–13	0.437 0.500	0.500–13UNF–2B MOD	0.452	0.457	0.50 0.56	0.510 0.510	0.520 0.520
3/8–24 7/16–20	9/16–12	0.500 0.562	0.5625–12UNF–2B MOD	0.515	0.521	0.56 0.62	0.572 0.572	0.582 0.582
7/16–20 1/2–20	5/8–11	0.625 0.625	0.625–11UNF–2B MOD	0.577	0.583	0.68 0.68	0.635 0.635	0.645 0.645
1/2–20	11/16–11NS	0.688	0.6875–11NS–2B MOD	0.640	0.646	0.75	0.700	0.710

NOTE :
TO INSURE PROPER LOCKING OF INSERT, MODIFIED MINOR DIAMETERS MUST BE HELD WITHIN STATED TOLERANCES. TO MEET THIS REQUIREMENT, IT IS RECOMMENDED THAT THE HOLE BE DRILLED UNDERSIZE, THEN TAP DRILLED OR REAMED TO FINAL SIZE. ALL DIMENSIONS ARE IN INCHES.

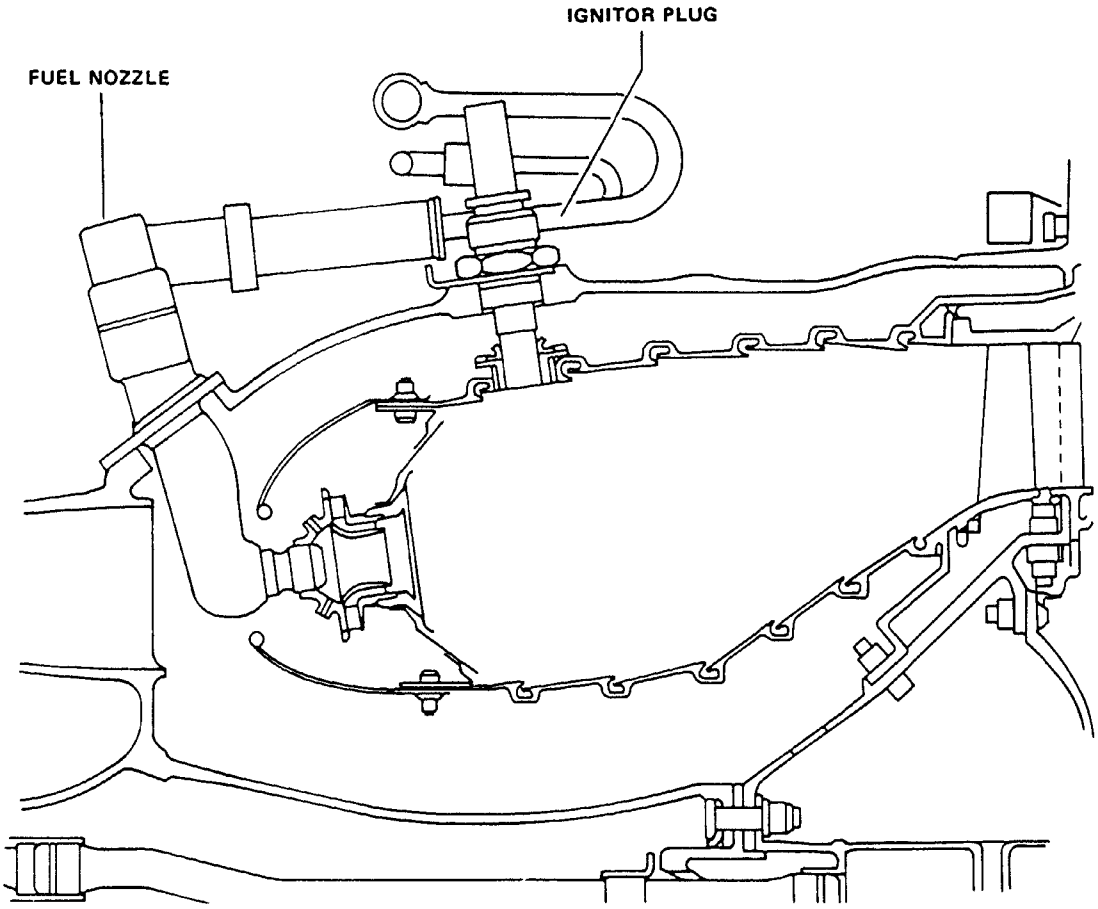
BM5 72 34 00 8 LCMO · 14 · 09
DM5

CF8–6191–00–A

Machining Requirements
Figure 803

COMBUSTION SECTION - DESCRIPTION AND OPERATION

1. General (Ref. Fig. 001)
   The combustion of fuel takes place in the combustor installed in the compressor rear frame. The controlled release of energy of combustion through the turbine nozzles drive the engine rotors. (HP rotor for self sustaining operation and the LP rotor to develop airflow through the fan exhaust nozzle and to provide gases to the core engine exhaust nozzle for additional thrust.)

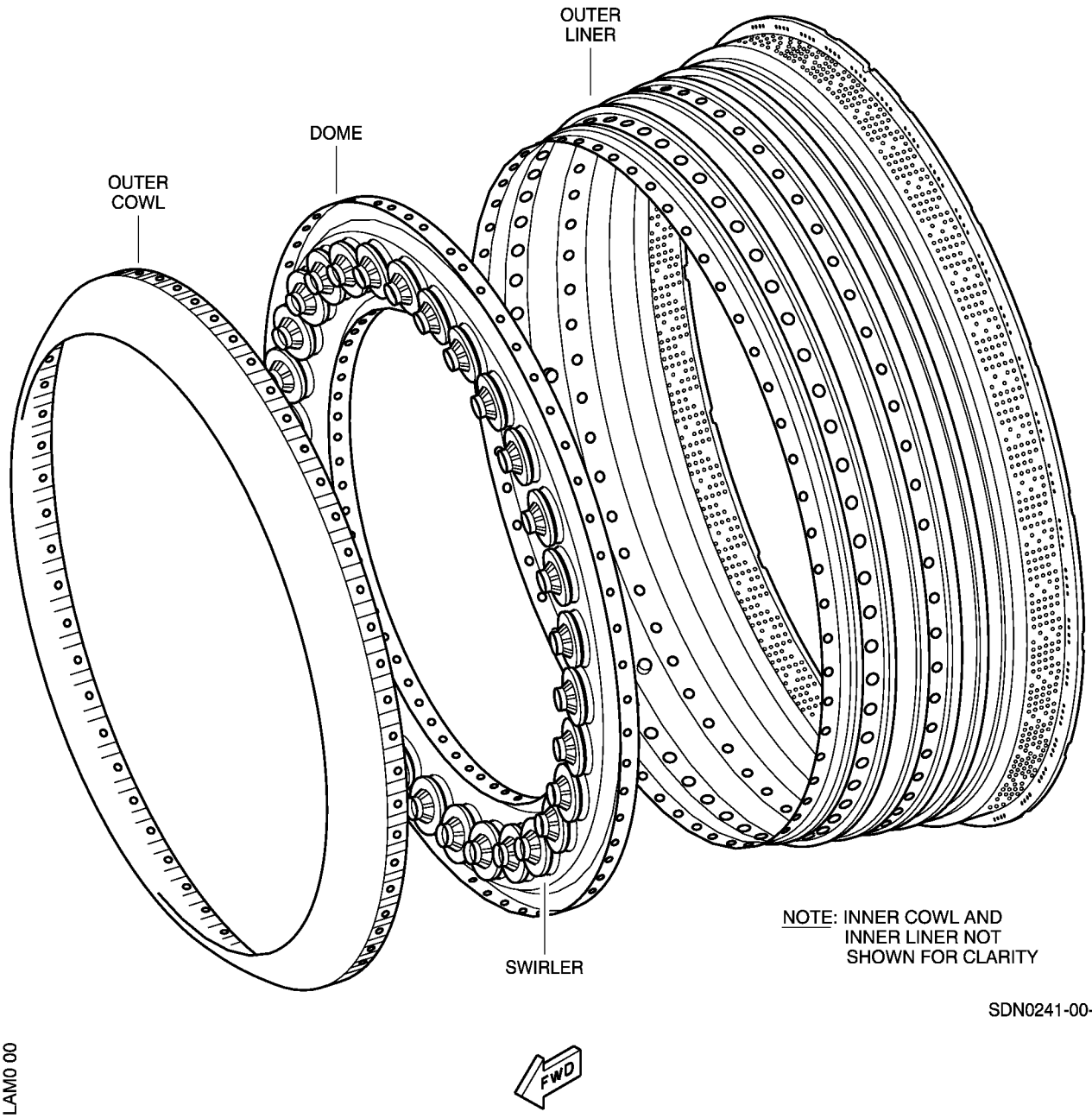


BM5 72 40 00 0 LAMO-13-07
DM5

Combustor Section
Figure 001

COMBUSTION CHAMBER ASSEMBLY - DESCRIPTION AND OPERATION

1. General (Ref. Fig. 001)
   The combustion chamber assembly is located in the aft portion of the compressor rear frame. It provides a zone for the combustion and control of the fuel air mixture.
   The combustor is built up of five major assemblies : inner and outer cowls, a dome, and inner and outer liners. The individual parts are bolted together for ease of disassembly and assembly.



BM5 72 41 00 0 LAM0 00

Combustor Chamber Assembly
Figure 001

2. Description

The combustor chamber assembly consists of the following major components :

- Cowl assembly.
- Liners.
- Dome.

A. Cowl Assembly

The cowl assembly consists of 2 parts - the inner and outer cowls - separated by the dome. Its purpose is to form a smooth leading edge which splits and meters the incoming airflow to the combustor. The cowl assembly is constructed of sheet metal rings formed around a dampening wire at the forward edge.

B. Liners

The inner and outer liners are composed of a series of circumferentially roller ring strips joined together by both resistance welding and brazing. They are protected from convective and radiant heat by continuous circumferential cooling. Primary combustion zone cooling air entry is provided by closely spaced holes in each ring. All ring holes are specifically sized for optimized cooling and combustor performance. These holes also increase recirculation for flame stabilization and admit the balance of primary combustion air. A thermal barrier coating is applied to the hot side of both liners. Igniters are located at 3 and 5 o'clock in panel 1 of the outer liner.

C. Dome

The dome is a fabricated component consisting of 30 vortex inducing swirl cups with venturis (one at each nozzle tip). Its purpose is to provide flame stabilization and mixing of the fuel air mixture. The entire surface of the dome is swept by a film of cooling air. A thermal barrier coating is applied to the hot side of the dome.

R # COMBUSTION CHAMBER ASSEMBLY - INSPECTION/CHECK

1. General

R Combustion Chamber Assembly procedure gives instructions to examine the
R internal areas of the combustor section (along the flow of the primary
R airstream). Use the borescope, in the borescope ports of the compressor rear
R frame for access to examine the internal combustor areas. You do not have to
R disassemble the engine to do this procedure. Sometimes during an inspection,
R damage will be found that is more than the maximum serviceable limits. The
R over serviceable limit extensions are then used to operate the airplane for
R additional flights.

2. Equipment and Materials

ITEM	DESIGNATION
A. Material No.C02-058	Antiseize Compounds, Lubricants, Oils (Ref. 70-00-00)
B. Material No.C10-071	Miscellaneous (Ref. 70-00-00)
C. 2C6388	Borescope Set-Fiber Light
Referenced Procedures	
R - 71-00-00, P. Block 501	Power Plant - General
R - 71-13-00, P. Block 301	Cowl Doors
R - 72-00-00, P. Block 601	Engine
R - 72-51-00, P. Block 601	First Stage HP Turbine Nozzle Assembly
R - 72-52-00, P. Block 601	Second Stage HP Turbine Nozzle Assembly
R - 72-53-00, P. Block 601	HP Turbine Rotor Assembly
R - 72-56-00, P. Block 601	LP Turbine Assembly
R - 72-57-00, P. Block 601	LP Turbine Rotor Assembly
R - 73-13-01, P. Block 401	Fuel Nozzle

3. Procedure

A. Job set-Up

(1)Open, safety and tag the appropriate circuit breakers.

(2)Open the fan cowl doors (Ref. 71-13-00, P. Block 301).

WARNING : OBEY THE APPLICABLE INSTRUCTIONS WHEN OPENING THE FAN REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(3)Open the fan reversers (Ref. 71-13-00, P. Block 301).

CAUTION : MAKE SURE THE TEMPERATURE OF THE ENGINE AND THE ADJACENT AREAS NEAR THE BORESCOPE INSPECTION PORTS ARE LESS THAN 150°F (66°C). DO NOT DO A BORESCOPE INSPECTION IF THE BORESCOPE INSPECTION PORTS ARE TOO HOT TO TOUCH. THIS WILL PREVENT DAMAGE TO THE BORESCOPE EQUIPMENT.

CAUTION : MAKE SURE YOU PUT A LABEL ON THE BORESCOPE PLUGS. ENGINE DAMAGE CAN OCCUR IF THE BORESCOPE PLUGS ARE PUT BACK IN THE INCORRECT LOCATION.

NOTE : If necessary, remove the ECS duct for easier access to the borescope plugs.

(4)Remove borescope plugs B2-1 through B2-5 (Ref. 72-00-00, P. Block 601 for port locations).

(5)Perform borescope inspection, use a Borescope set-fiber light 2C6388G06 or G07.

R

B. Inspect the Following :

NOTE : Stage 1 HPT nozzle overall condition can best be seen by the use of the combustor borescope ports. It is recommended that vanes be inspected whenever the combustor is exposed.
The stage one HPT nozzle should be inspected per the serviceable limits of Section 72-51-00 at this time.

NOTE : The following limits are for those areas that can be seen by borescope inspection.

(1)All surfaces for :(Ref. Fig. 601)

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
R (a)Discoloration	Any amount permitted	No maintenance necessary
R (b)Carbon accumulation	Any amount permitted	No maintenance necessary

(2)Dome assembly (Dome plate, splash plate, and dome sleeve) for :

R (Ref. Fig. 601, 602, 603)
R (Ref. Fig. 604, , 605)
R NOTE : All maximum serviceable limits for the dome assembly table are applicable to Pre LEC and Post LEC configurations unless otherwise noted.

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
R (a)Distortion of splash plate or dome sleeve	Any amount permitted	No maintenance necessary
R (b)Missing splash plate	Not permitted.	Remove the engine if damage is more than the limit.
R (c)Splash plate circumferential cracks	Not permitted.	See over serviceable limit extensions (Ref. 72-00-00, P. Block 601).
R (d)Splash plate edge/radial cracks	(Pre LEC Combustor) Pre GE SB 72-0840 (field) or Pre GE SB 72-0789 (production)	See over serviceable limit extensions (Ref. 72-00-00,

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
R		P. Block 601).
R	Relative to the centerline of the dome cup, any number of edge/radial cracks less than 0.20 in. (5.08 mm) long are permitted. Edge/radial cracks less than 0.30 in. (7.62 mm) long are permitted, four per splash plate, separated by 90 degrees of non-cracked metal. Edge/radial cracks less than 0.60 in. (15.24 mm) long are permitted, one per splash plate. Edge/radial cracks more than 0.60 in. (15.24 mm) long are not permitted.	
R	(Post LEC Combustor) Post GE SB 72-0840 (field) or Post GE SB 72-0789 (production)	
R	Relative to the centerline of the dome cup, any number of edge/radial cracks less than 0.20 in. (5.08 mm) long are permitted. Edge/radial cracks up to 0.30 in. (7.62 mm), two per splash plate separated by 90 degrees of non-cracked metal. Edge/radial cracks more than 0.30 in. (7.62 mm) long are not permitted.	
R (e)Splash plate interconnected edge/radial/ circumferential cracks	Not permitted.	See over serviceable limit extensions (Ref. 72-00-00, P. Block 601).
R (f)Missing material from the splash plate	Not permitted. Except for missing material from edge erosion that is within limits (see below).	See over serviceable limit extensions (Ref. 72-00-00, P. Block 601).

	INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
R	(g)Splash plate edge erosion	(Pre LEC Combustor) Pre GE SB 72-0840 (field) or Pre GE SB 72-0789 (production)	See over serviceable limit extensions (Ref. 72-00-00, P. Block 601).
R		Edge erosion is permitted if the total accumulative damaged area is less than 0.30 in. by 3.0 in. (7.62 mm by 76.20 mm).	
R		(Post LEC Combustor) Post GE SB 72-0840 (field) or Post GE SB 72-0789 (production)	
R		Edge erosion is permitted if the total accumulative damaged area is less than 0.30 in. by 3.0 in. (7.62 mm by 76.20 mm).	
R	(h)Axial or radial cracks between cooling holes in the dome plate	Any number permitted if not connected.	
R	(j)Circumferential cracks in the dome plate	Any number permitted if less than 0.50 in. (12.70 mm) in length, or five less than 1 in. (25.40 mm) in length, provided there is 2.0 in. (50.80 mm) between cracks.	See over serviceable limit extensions (Ref. 72-00-00, P. Block 601).
R	(k)Overhang metal that is gone from the dome plate	Five damaged areas permitted on each dome plate overhang, if less than 0.50 in. (12.70 mm) by 1 in. (25.40 mm).	See over serviceable limit extensions (Ref. 72-00-00, P. Block 601).
R	(l)Burn through holes in the dome plate	Three on each dome plate permitted, if less than 1 in. (25.40 mm) by 1 in. (25.40 mm).	See over serviceable limit extensions (Ref. 72-00-00, P. Block 601).
R	(m)Inner and outer band cracks	Not permitted.	See over serviceable limit extensions

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
R		(Ref. 72-00-00,
R		P. Block 601).
(3)Inner/outer combustion liner panels for : R (Ref. Fig. 601, 606, 607) R NOTE : A closed or decreasing combustor liner overhang gap shortens the R life span of the combustor, leading to distortion, bulging, or R burn through.		

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(a)Axial and connected cracks	Any number of cracks less than one panel are permitted. No more than 30 cracks of one panel length per liner are permitted. No more than seven cracks that extend across two panels per liner are permitted. Any two panel cracks must have a borescope inspection every 200 cycles to make sure the crack does not increase. Cracks greater than two panels are not permitted. Axial cracks interconnected with any other cracks are not permitted	See over serviceable limit extensions (Ref. 72-00-00, P. Block 601).
(b)Circumferential cracks and connected cracks	Circumferential cracks between two dilution holes not more than three in any one panel. Any cracks must be separated by a minimum of three non (circumferential or axial) cracked dilution holes. Circumferential cracks in non-dilution hole panels not more than two in any one panel. Any cracks must not be more than 2.5 in. (64 mm) in length separated by a minimum of 5 in. (127 mm) of non cracked material (circumferential or axial cracks). Circumferential cracks interconnected with any other cracks are not permitted.	See over serviceable limit extensions (Ref. 72-00-00, P. Block 601).

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(c)Random, multiple cracks from dilution hole or burned area	Not thought to be interconnected cracks. Any amount is serviceable if you refer to axial and circumferential cracks for individual crack length. Total accumulative crack length for multiple crack condition is 2.5 in. (64 mm).	
R (d)Inner liner burn through	Total area of burned through missing material equivalent to six (Qty 6) .5 in. dia. holes (13 mm) or 1.25 sq. in. (806.5 sq. mm) of missing material is permitted. R Make sure conditions are not R more than the following : - If a dilution hole [typical dilution hole = 0.5 in. (13 mm) in diameter or 0.2 sq.in. (129 sq. mm)] is contained in the damaged area, subtract its area when you calculate the missing material. - Any area of burned, missing material must be separated by one dilution hole with no distress or 2 in. (51 mm) (circumferential direction) on panels with no dilution holes. - Areas of burn through across three adjacent panels in an axial direction is not permitted. - An area of burn through greater than 0.2 sq.in. (129 sq.mm) or 0.5 in. (13 mm) in diameter (non dilution hole R location) is not permitted. R - If an area of burn through R includes a dilution hole R location, the total burn R through area (including the R dilution hole) greater than R 0.40 sq.in. (258 sq.mm) R or 0.75 in. (19.05 mm) in	See over serviceable limit extensions (Ref. 72-00-00, P. Block 601).

	INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
R		diameter is not permitted. At first report of inner liner burn through, do a borescope inspection of the stage 1 and 2 high pressure turbine nozzle (Ref. 72-00-00, P. Block 601).	
R	(e)Outer liner burn through	Not permitted.	See over serviceable limit extensions (Ref. 72-00-00, P. Block 601).
R	(f)Metal that is gone from the liner overhang	Up to 14 damaged areas, 0.5 in. (12.7 mm) circumferential length by 0.1 in. (2.5 mm) axial length are permitted on each combustor assembly. 3 adjacent damaged panels are not permitted.	See over serviceable limit extensions (Ref. 72-00-00, P. Block 601).
	(g)Distortion	Permitted if not more than 0.5 in. (12.7 mm) from original contour	See over serviceable limit extensions (Ref. 72-00-00, P. Block 601).
R	(h)Decrease in the inner and the outer combustor liner overhang gap	Permitted.	A closed or decreasing combustor liner overhang gap shortens the life span of the combustor, leading to distortion bulging, or burn through.
R	(j)Bulges	Permitted, if less than 0.050 in. (1.27 mm) within any 2 in. (50.8 mm) by 1 in. (25.4 mm) area. Bulges in the inner and outer combustor liner panels are caused by an inner and/or outer combustor liner overhang gap, which	See limit extensions (Ref. 72-00-00, P. Block 601).

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
	slowly moves together or closes.	
(4)Outer combustion liner panel (igniter tube and igniter ferrule) for : (Ref. Fig. 601, 608)		

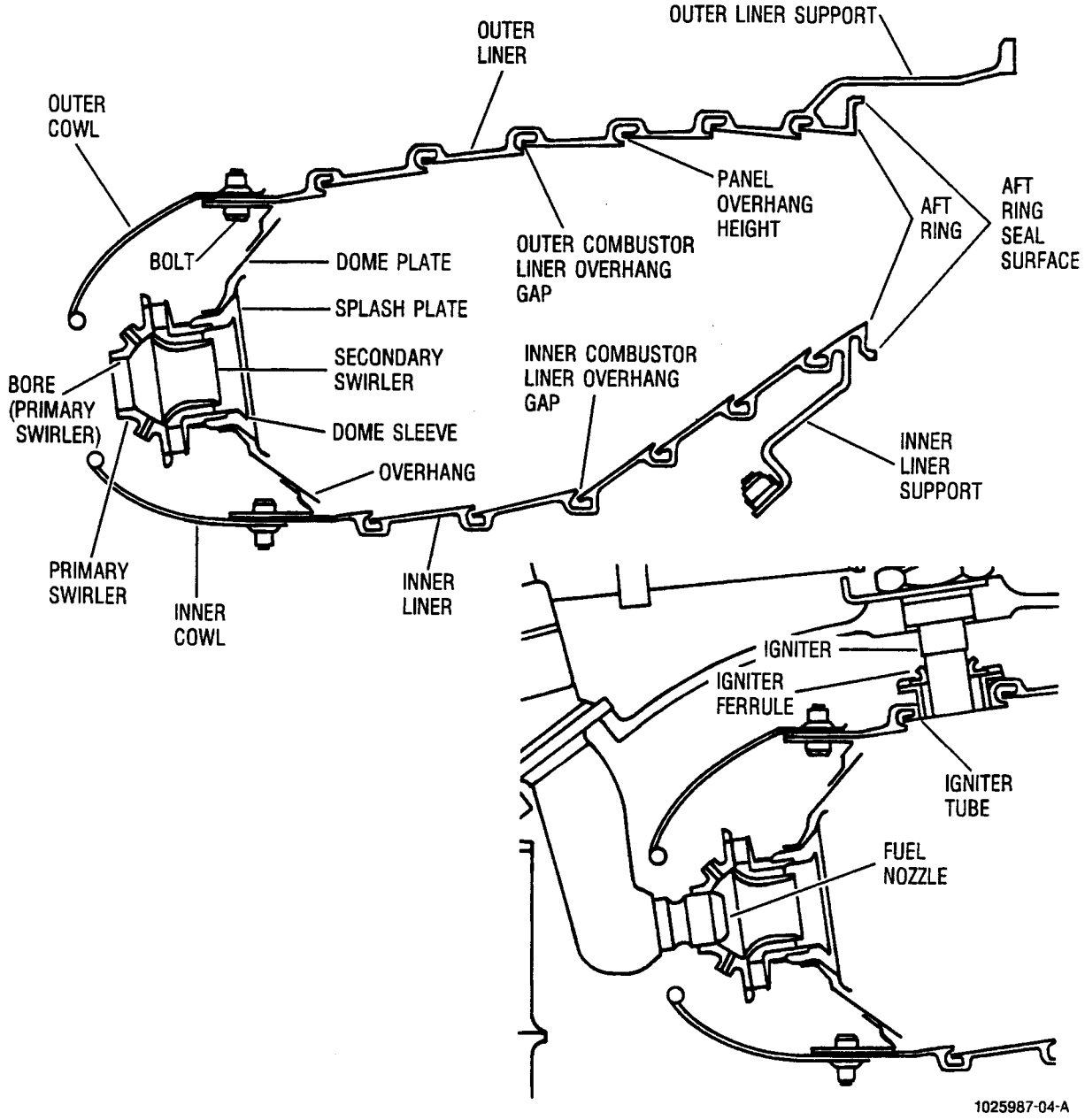
INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(a)Cracks in weld on igniter tube	One for each tube, up to one third of the circumference of the tube.	See over serviceable limit extensions (Ref. 72-00-00, P. Block 601).
(b)Cracks on igniter tube	Any number permitted.	No maintenance necessary.
(c)Metal that is gone from the igniter tube	Missing material of any amount in both igniter tubes. Not permitted. If metal is gone from one igniter tube, perform the following : 1) Inspection limits for secondary damage is met or no residual material is found in the following locations : a) No residual material in combustor. b) Borescope Inspection of the High Pressure Turbine - 1st stage HPT nozzle assembly (Ref. 72-51-00, P. Block 601). - 2nd stage HPT nozzle assembly (Ref. 72-52-00, P. Block 601). - HPT rotor assembly (Ref. 72-53-00, P. Block 601). c) Borescope Inspection of the Low Pressure Turbine - LPT assembly (Ref. 72-56-00, P. Block	Remove the engine if damage is more than the limit.

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
	601). - LPT rotor assembly (Ref. 72-57-00, P. Block 601). 2) Engine can be operated per A310 and A300-600 MMEL allowances assuming that the ignition system at the location of the missing metal from igniter tube is considered to be non-operational and the engine can be started using the ignition system for the other channel using Engine Start Procedure (Ref. 71-00-00, P. Block 501).	
(d)Burns in the igniter ferrule	Burns of any amount in both igniter ferrules. Not permitted. Burns in one igniter ferrule of any amount permitted, provided the following is performed : 1) Engine can be operated per A310 and A300-600 MMEL allowances assuming that the ignition system at the location of the burns in the igniter ferrule is considered to be non-operational and the engine can be started using the ignition system for the other channel using Engine Start Procedure (Ref. 71-00-00, P. Block 501).	Remove the engine if damage is more than the limit.
(e)Missing igniter ferrule	Two ferrules missing. Not permitted. If one ferrule is missing, perform the following :	Remove the engine if damage is more than the limit.

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
	1) Inspection limits for secondary damage is met or no residual material is found in the following locations : a) No residual material in combustor. b) Borescope Inspection of the High Pressure Turbine - 1st stage HPT nozzle assembly (Ref. 72-51-00, P. Block 601). - 2nd stage HPT nozzle assembly (Ref. 72-52-00, P. Block 601). - HPT rotor assembly (Ref. 72-53-00, P. Block 601). c) Borescope Inspection of the Low Pressure Turbine - LPT assembly (Ref. 72-56-00, P. Block 601). - LPT rotor assembly (Ref. 72-57-00, P. Block 601). 2) Engine can be operated per A310 and A300-600 MMEL allowances assuming that the ignition system at the location of the missing ferrule is considered to be non-operational and the engine can be started using the ignition system for the other channel using Engine Start Procedure (Ref. 71-00-00, P. Block 501).	

(5)Fuel nozzle for :
(Ref. Fig. 601)

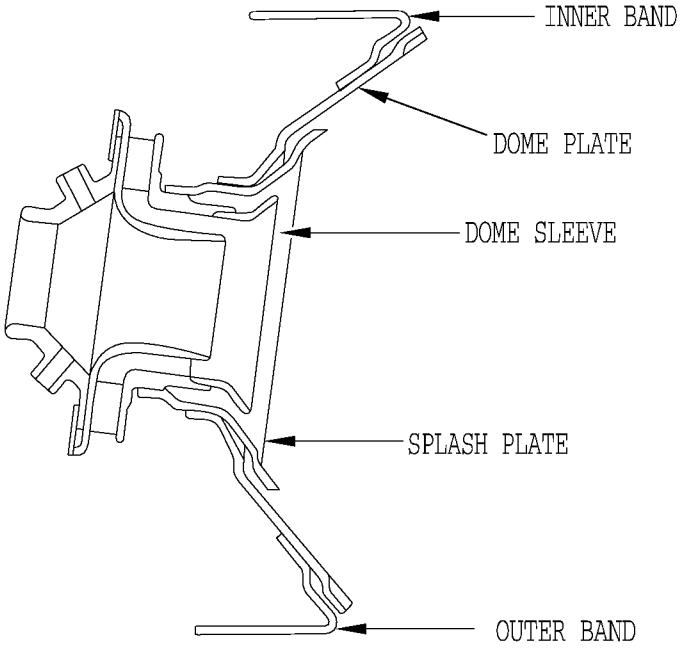
INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(a)Carbon on fuel nozzle	Permitted	No maintenance necessary

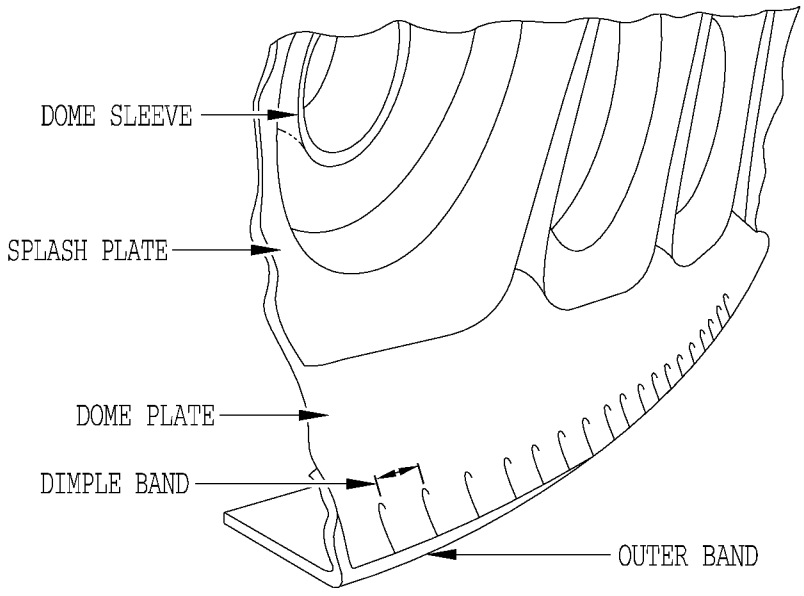


BM5 72 41 00 6 LAMD 02

Combustion Chamber Assembly
Figure 601

R



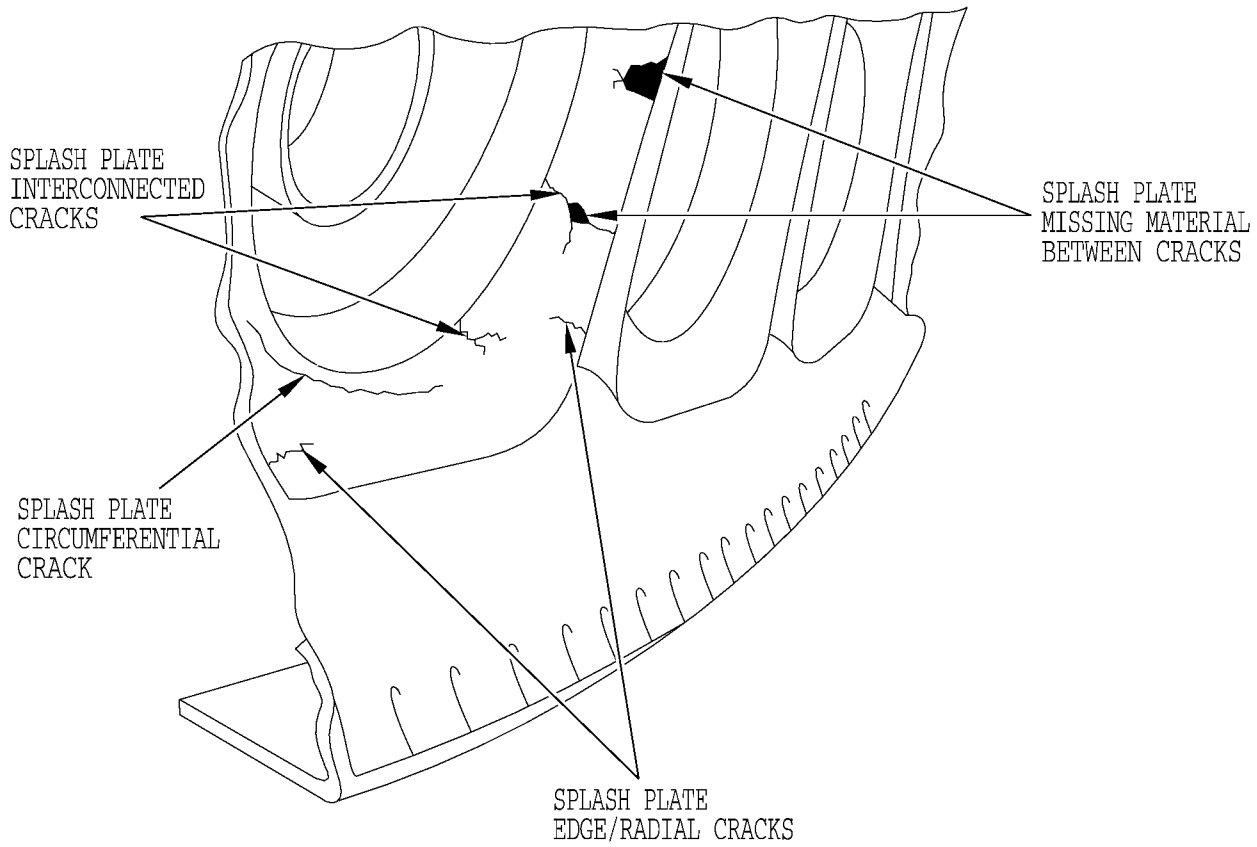


BM5 72 41 00 6 LCM0 04

1289883-00

Combustion Dome and Splash Plate Inspection
Figure 602

R

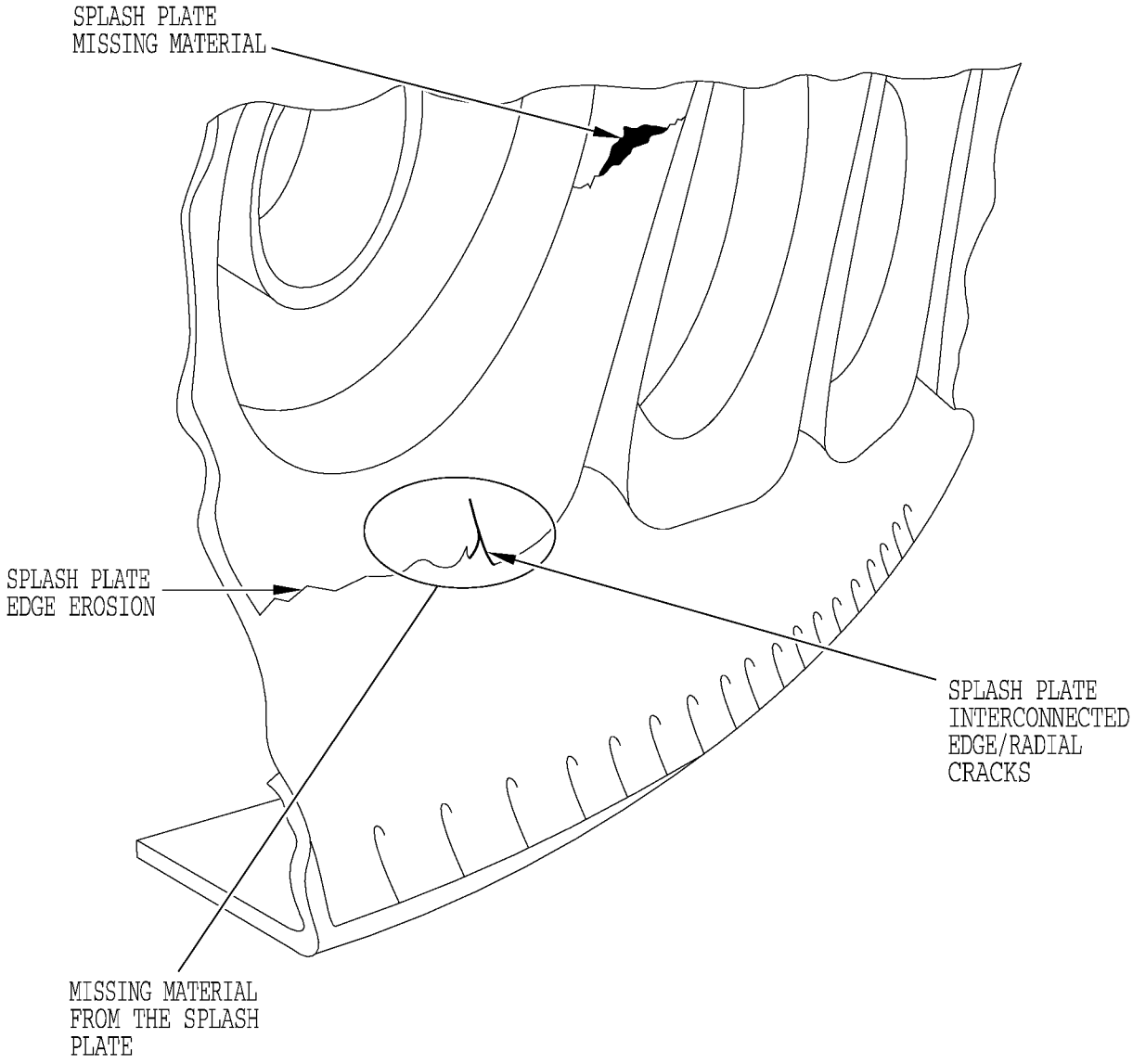


BM5 72 41 00 6 LDM0 01

1289884-00

Combustion Splash Plate
Missing Material and Crack Inspection
Figure 603

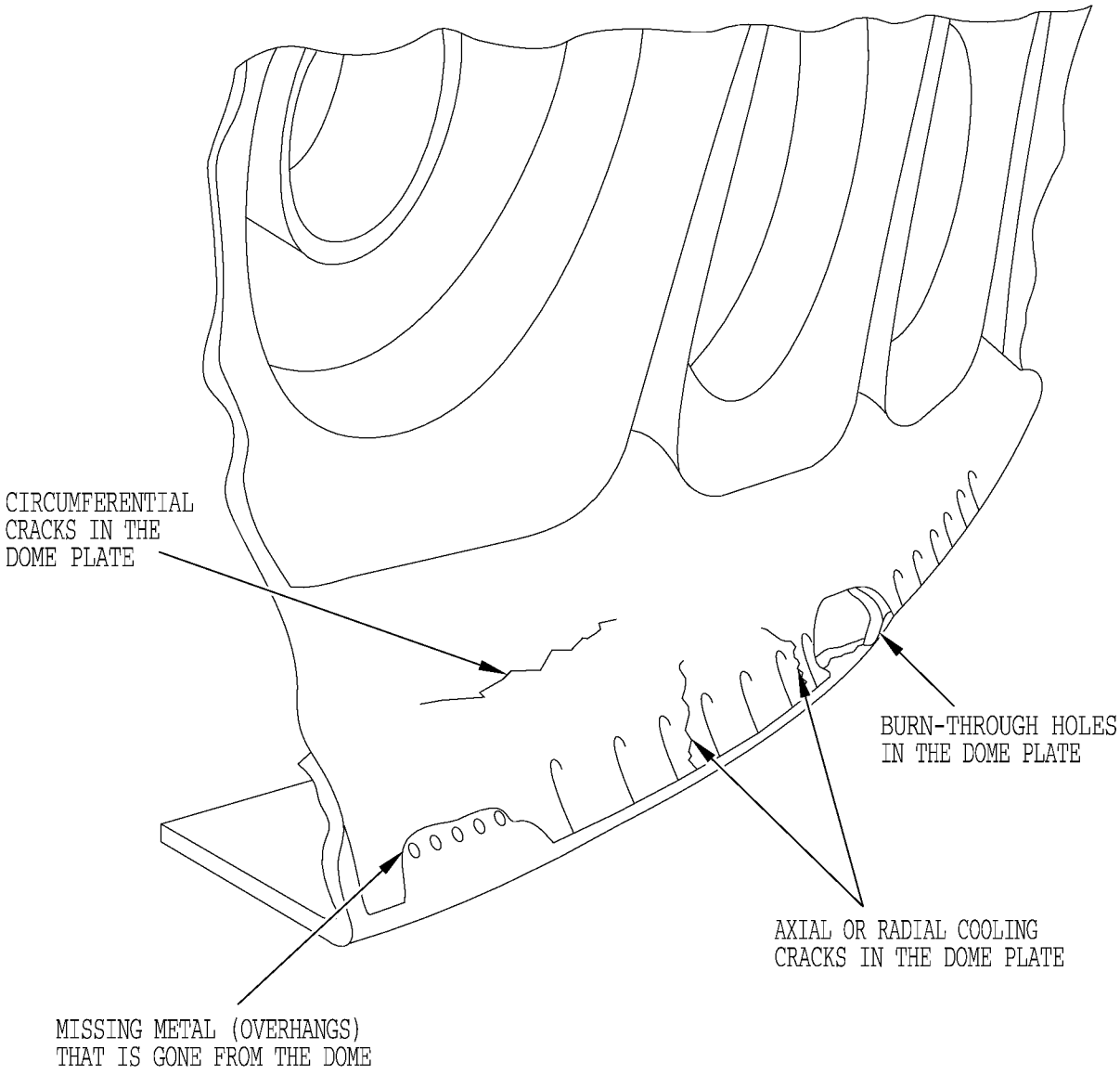
R



BM5 72 41 00 6 LEM0 03

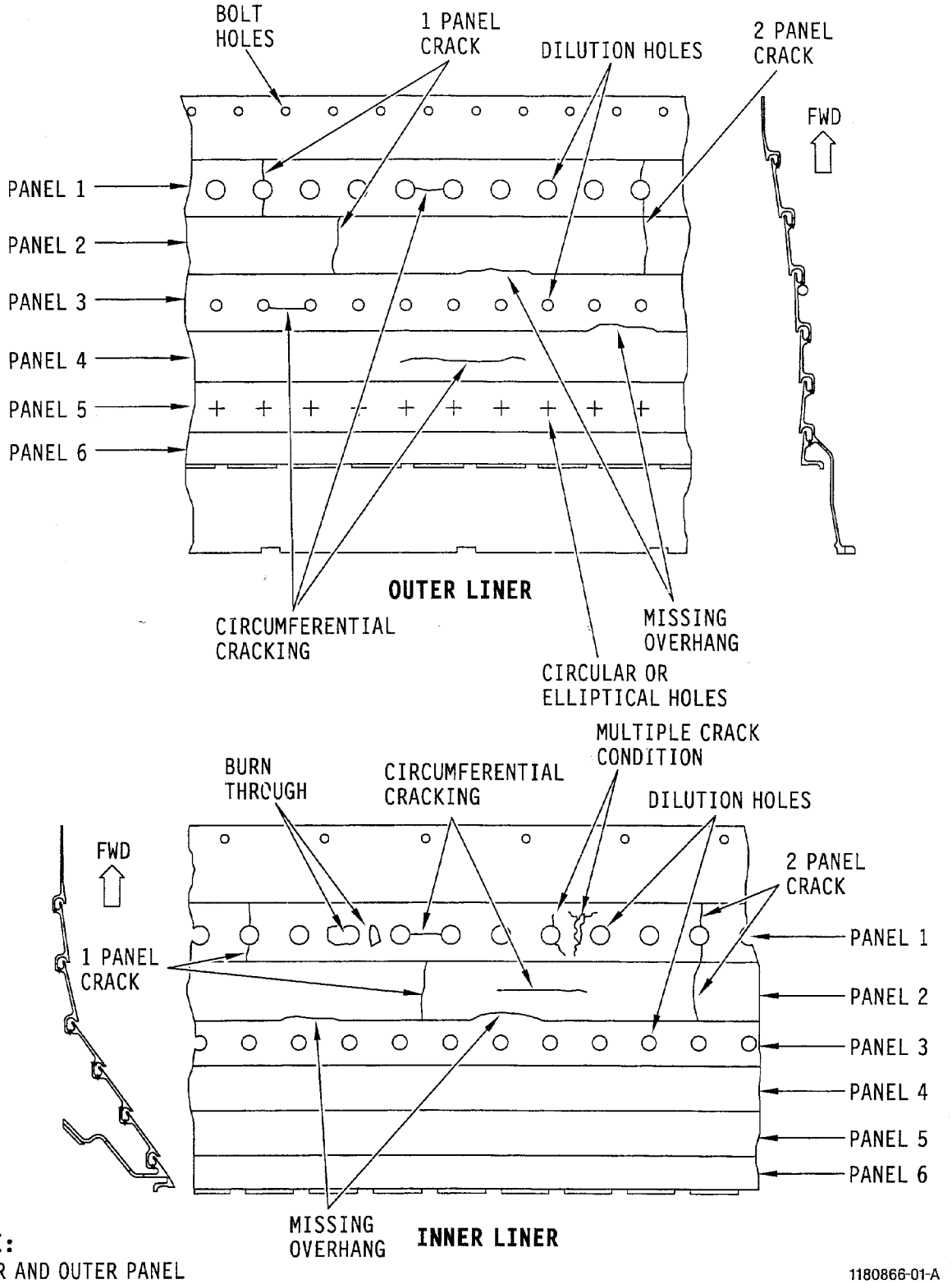
Combustion Splash Plate, Edge Erosion with Interconnected Edge/Radial Cracks Causes Missing Material
Figure 604

R



BM5 72 41 00 6 LHM0 00

Combustion Dome Burns/Missing Metal and Crack Inspection
Figure 605

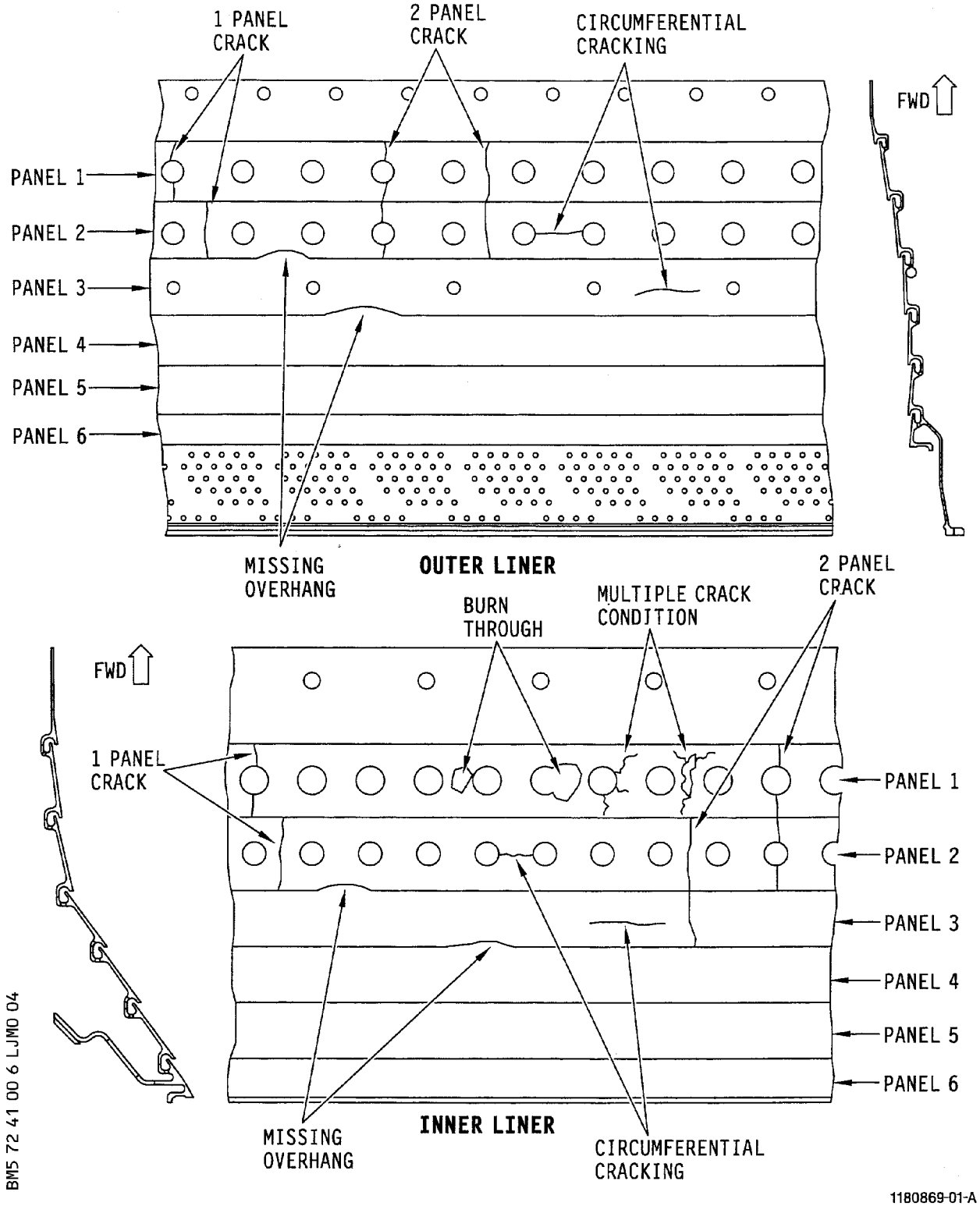


NOTE:
INNER AND OUTER PANEL

1180866-01-A

BM5 72 41 00 6 LGMO 04

Combustion Section - Inner/Outer Liners Cracks, Burns, and Missing Material (Pre LEC)
Figure 606



Combustion Section - Inner/Outer Liners Cracks, Burns, and Missing Material (Post LEC)
Figure 607

R (6)Combustor cowl for :
R (Ref. Fig. 601)

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
R (a)Burns	Not permitted.	Examine fuel nozzles, (Ref. 73-13-01, P. Block 401)
R (b)Cracks	Any number permitted if less than 0.25 in. (6.4 mm) long	Remove the engine if damage is more than the limit.

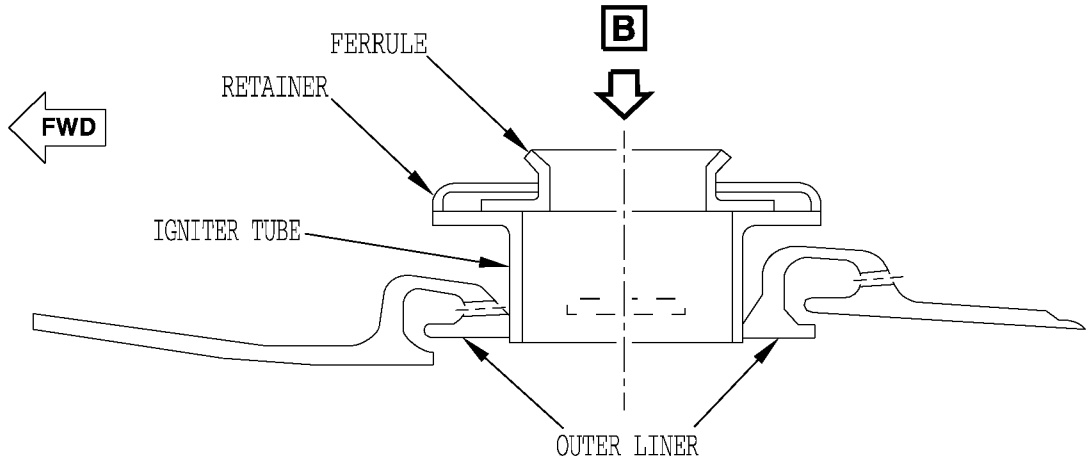
C. Close-Up

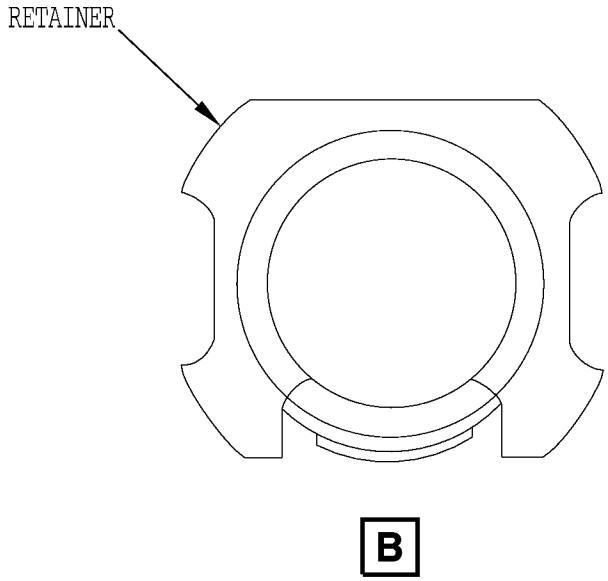
CAUTION : MAKE SURE THE BORESCOPE PLUGS ARE INSTALLED IN THE CORRECT PORT LOCATIONS. ENGINE DAMAGE CAN OCCUR IF A BORESCOPE PLUG IS INSTALLED IN THE INCORRECT LOCATION.

(1)When inspection is complete, lubricate, replace, torque (Ref. 72-00-00, P. Block 601) and safety the plugs with wire.
(2)Install the ECS duct if it was removed.
(3)Remove safety clips and tags and close the appropriate circuit breakers.

WARNING : OBEY THE APPLICABLE INSTRUCTIONS WHEN CLOSING THE FAN REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(4)Close the fan reversers (Ref. 71-13-00, P. Block 301).
(5)Close the fan cowl doors (Ref. 71-13-00, P. Block 301).





1289888-00

BM5 72 41 00 6 LPM0 01

Combustion Dome Igniter
Tube and Ferrule Inspection
Figure 608

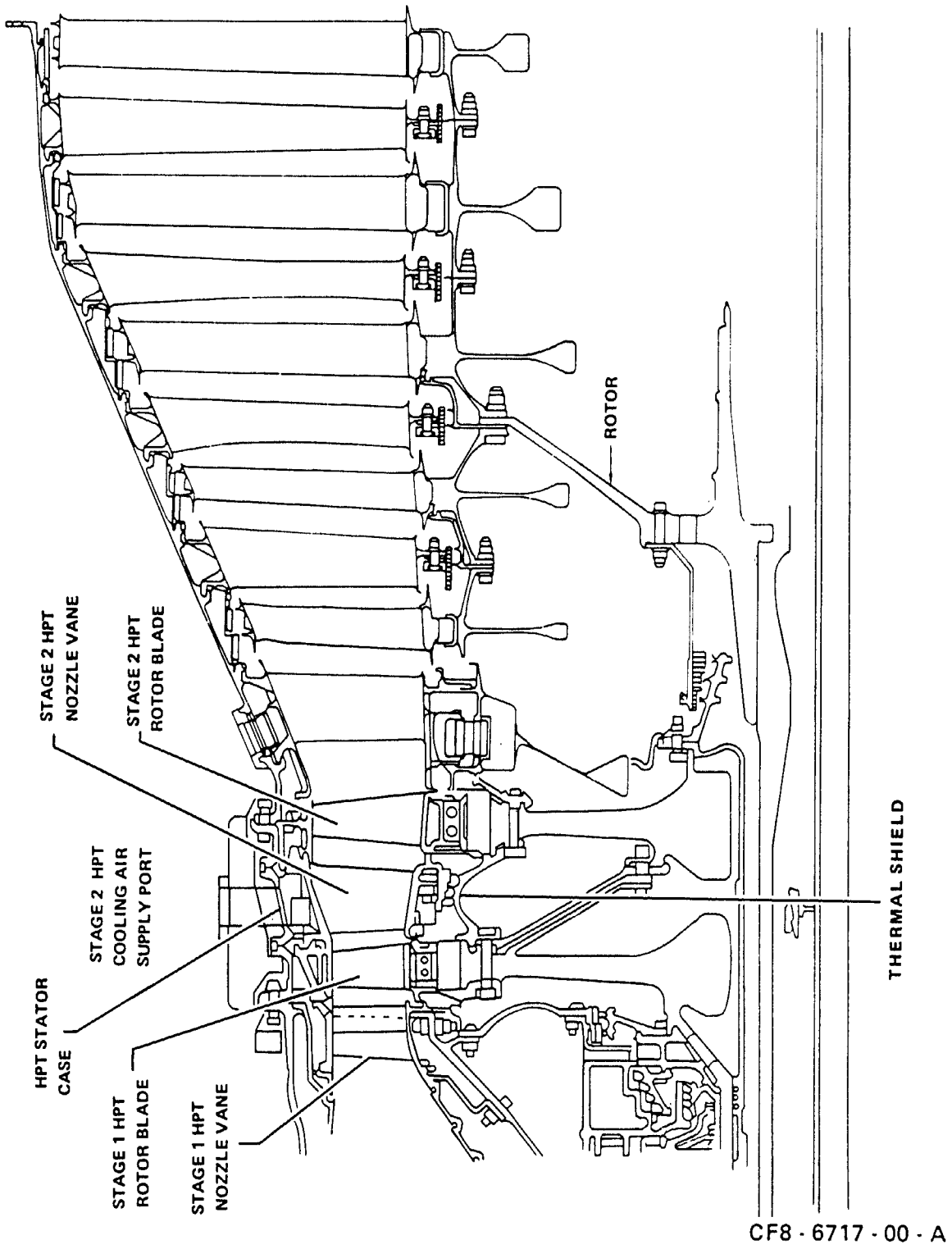
R

TURBINE SECTION - DESCRIPTION AND OPERATION

1. General (Ref. Fig. 001)
   The modules of the turbine are : the high pressure turbine and the low pressure turbine.

2. High Pressure Turbine Module
   The high pressure turbine is a two stage turbine, consisting or a two stage HP rotor assembly, stage 1 nozzle assembly, and stage 2 nozzle assembly. The rotor is connected to the HP compressor rotor and supported by the 4R and 5R bearings. The stage 1 nozzle assembly is bolted to the CRF inner structure and is supported at the outside diameter by the HPT outer structure, the stage 2 nozzle assembly forms the engine outer structure and turbine flow path.

3. Low Pressure Turbine Module
   The low pressure turbine is a 5 stage system consisting of a turbine rotor, stator case and nozzles, a turbine rear frame, and fan mid shaft.


ROTOR
STAGE 2 HPT NOZZLE VANE
STAGE 2 HPT ROTOR BLADE
STAGE 2 HPT COOLING AIR SUPPLY PORT
THERMAL SHIELD
HPT STATOR CASE
STAGE 1 HPT ROTOR BLADE
STAGE 1 HPT NOZZLE VANE
CF8 - 6717 - 00 - A

BM5 72 50 00 0 LAMO - 14 - 09
DM5

Turbine Section
Figure 001

STAGE 1 HIGH PRESSURE TURBINE NOZZLE ASSEMBLY - INSPECTION/CHECK

1. General

Inspection of the stage 1 high pressure turbine (HPT) nozzle assembly is limited to inspection of those areas that can be seen. Use a borescope, in the borescope ports of the compressor rear frame. This section includes inspection of HPT stage 1 shroud segments.

2. Equipment and Materials

ITEM	DESIGNATION
A. 2C6388	Borescope Set, Fiber light
Referenced Procedures	
- 72-00-00, P. Block 601	Engine General
- 72-41-00, P. Block 601	Combustion Chamber Assembly
- 71-00-00, P. Block 501	Power Plant - General

3. Procedure

A. To inspect stage 1 nozzle vanes, remove the borescope plus B2-1 through B2-5. (Ref. 72-00-00, P. Block 601 for port locations).

B. To inspect stage 1 shrouds, remove borescope plugs B3-1 and B3-2.

C. Perform borescope inspection, use a borescope set 2C6388G06 or G07.

D. When inspection is complete, reinstall borescope plugs (Ref. 72-00-00, P. Block 601)

NOTE : For manual N2 rotor cranking (Ref. 71-00-00, P. Block 501).

NOTE : Coat tip of plug B3-1 at interface to HPT nozzle.

4. Borescope Inspection Check

Inspect the following :

NOTE : With the borescope plugs removed, combustor assembly inspection is recommended (Ref. 72-41-00, P. Block 601).

NOTE : The maximum serviceable limits apply only to the observable areas during borescope inspection.

NOTE : You may see wear and dents on the B3-1 borescope plug sleeve. This is acceptable if the damage is not through the sleeve and you can install the plug without difficulty.

A. Leading Edge of Vane Airfoil for : (Ref. Fig. 601).

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(1)Cracks interconnecting nose holes	Permitted	
(2)Cracks inter-	Permitted if the crack does	See limit extensions,

	INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
	connecting nose holes and extending into concave and/or convex surface	not extend past the 6th film row of cooling holes on the concave side and does not extend past the 2nd film row of cooling holes on the convex side, with no material gone.	(Ref. 72-00-00, P. Block 601).
	(3)Cracks propagating from nose holes, but not interconnecting nose holes	Permitted	
R	(4)Burns or erosion not fully through the metal	Permitted	
R	(5)Material that is gone fully through parent metal	0.3 sq.in. (194 sq.mm) for each vane, maximum of four vanes in a 90 degree arc	If the adjacent vanes are damaged, replace 3 fuel nozzles upstream of the damaged area within the next 100 flight cycles. See limit extensions, (Ref. 72-00-00, P. Block 601).

B. Concave Surface of Vane Airfoil For : (Ref. Fig. 601)

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(1)Radial cracks out of film holes	Permitted	
(2)Other cracks (not in film hole rows)	Permitted	
(3)Burns, spalls or erosion (no holes through the base metal)	Permitted	

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(4)Missing material (through the base metal)	Any number, if the total damage is not more than 0.1 sq.in. (64.5 sq.mm)	See limit extensions, (Ref. 72-00-00, P. Block 601).
(5)Cracks in fillet area adjacent to inner and outer platforms	Permitted	

C. Convex Surface of Vane Airfoil for :(Ref. Fig. 601)

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(1)Radial cracks where material is not lifted	Any number, no missing material	See limit extensions, (Ref. 72-00-00, P. Block 601)
(2)Radial cracks where material is lifted one side of the crack in relation to the other side	Permitted if the material is lifted less than the thickness of the airfoil wall and no material is gone.	See limit extensions, (Ref. 72-00-00, P. Block 601)
(3)Axial cracks	Any number, no missing material. Also see limits for leading edge cracks	See limit extensions, (Ref. 72-00-00, P. Block 601)
(4)Burns	Any number, no missing material or burnthrough	See limit extensions, (Ref. 72-00-00, P. Block 601)
(5)Radially oriented cracks fillet area adjacent to inner and outer platforms	Any number, no missing material	See limit extensions, (Ref. 72-00-00, P. Block 601)

D. Trailing Edge of Vane Airfoil for : (Ref. Fig. 601)

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(1)Axial cracks originating from slots adjacent to trailing edge	Any number	

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(2)Buckling or bowing	Any amount	
(3)Burns, tears or dents (loss of metal)	Total area removed from trailing edge not to exceed 6.0 sq in. (39 sq cm) per assembly, 1.5 sq in. (10 sq cm) per airfoil	See limit extensions, (Ref. 72-00-00, P. Block 601)

E. All Areas of Airfoil for : (Ref. Fig. 601)

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(1)Craze cracks	Any amount	
NOTE : Craze cracks are superficial cracks that do not break the coating surface.		
(2)Nicks, scores, scratches, and dents	Any number	
(3)Metal splatter	Any amount	

F. Inner and Outer Platform for :

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(1)Cracks in parent metal	Any number	See limit for missing material
(2)Nicks, scores, scratches and dents	Any number	
(3)Burns or erosion	Any amount not through platform	See limit for missing material. See limit extensions, (Ref. 72-00-00, P. Block 601)
(4)Bulges or bowing	Not serviceable	See limit extensions, (Ref. 72-00-00, P. Block 601)

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(5)Missing material	Material that is burnt or missing, that has gone all the way through the platforms, cannot be more than 0.2 sq.in. (129 sq.mm) per vane and 1.0 sq.in. (645 sq.mm) per nozzle assembly.	See limit extensions, (Ref. 72-00-00, P. Block 601)

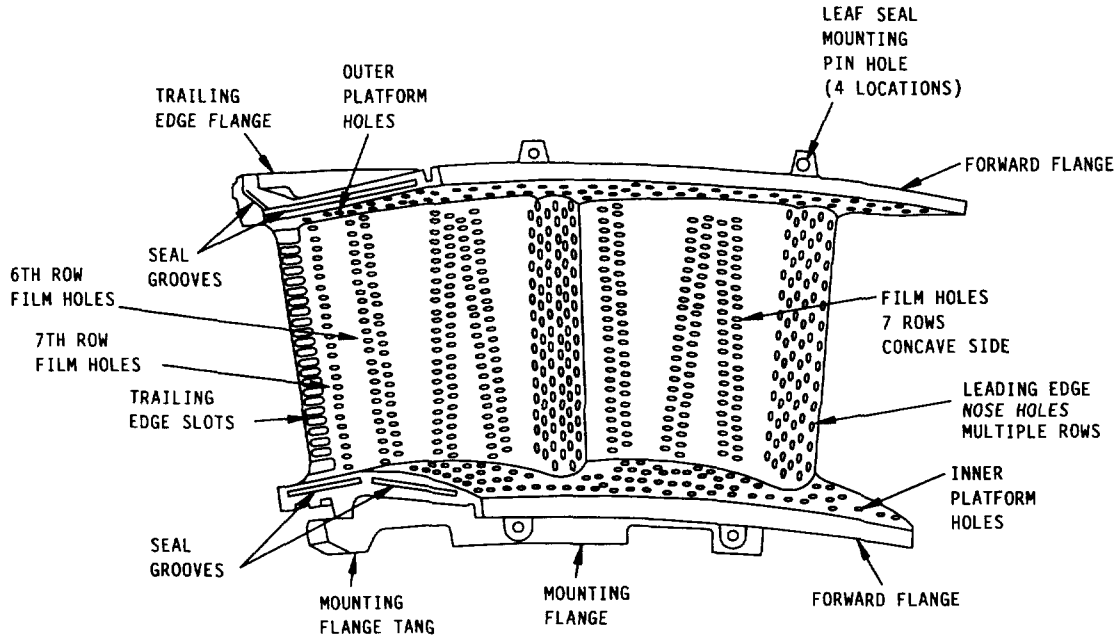
G. Forward Outer and Forward Inner Leaf Seals for : (Ref. Fig. 601)

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(1)Forward outer leaf seals disengaged or gone	Any amount Disengaged leaf seals may extend into hot gas flowpath	
(2)Forward inner leaf seals disengaged or gone	Permitted, the disengaged leaf seals can extend into the hot gas flowpath if airfoil distress is within the limits	

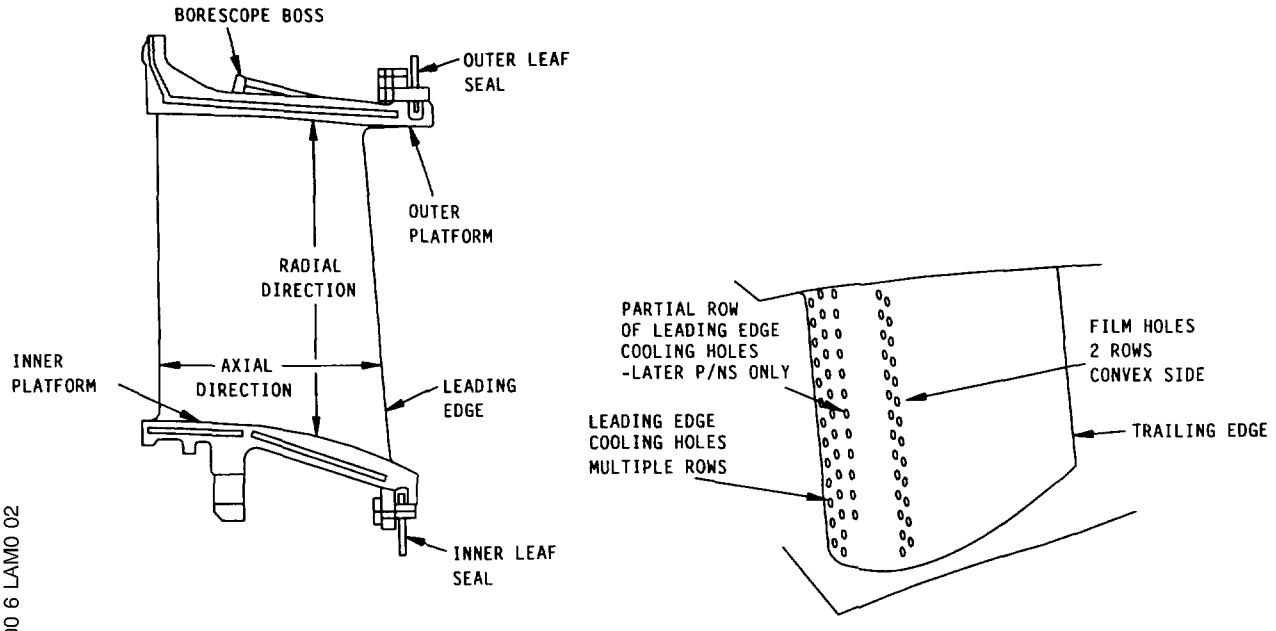
H. Stage 1 Shroud Rub Surface for (Ref. Fig. 602)

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(1)Axial cracks	Any number up to 0.150 in. (3.81 mm), four up to 1.00 in. (25.4 mm) per segment. One crack per segment entirely across provided it is separated from other cracks by a minimum of 0.125 in. (3.18 mm)	See limit extensions, (Ref. 72-00-00, P. Block 601), Stage 2 HPT Nozzle Assembly
(2)Circumferential cracks	Any number up to 0.375 in. (9.53 mm) separated by 0.125 in. (3.18 mm)	See limit extensions, (Ref. 72-00-00, P. Block 601), Stage 2 HPT Nozzle Assembly
(3)Radial cracks in gas face forward wall	3 per segment across forward wall separated by 0.50 in. (12.7 mm)	See limit extensions, (Ref. 72-00-00, P. Block 601), Stage 2 HPT Nozzle

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
		Assembly
(4)Interconnecting cracks	Any axial and circumferential cracks up to maximum limits of steps (1) and (2) is serviceable. Limit is exceeded when any third crack connects (except at shroud ends).	See limit extensions, (Ref. 72-00-00, P. Block 601), Stage 2 HPT Nozzle Assembly
R (5)Missing R material	Maximum area of 0.09 sq.in. (2.2 sq.mm) with maximum dimensions not to exceed 0.300 in. (7.62 mm) circumferentially (Dimension A) X 0.90 in. (22.9 mm) axially (Dimension B) to depth of seal slot may be missing from each circumferential end of the shroud	See limit extensions, (Ref. 72-00-00, P. Block 601), Stage 2 HPT Nozzle Assembly



VIEW IN THE AFT DIRECTION OF THE CONCAVE SIDE OF THE VANE

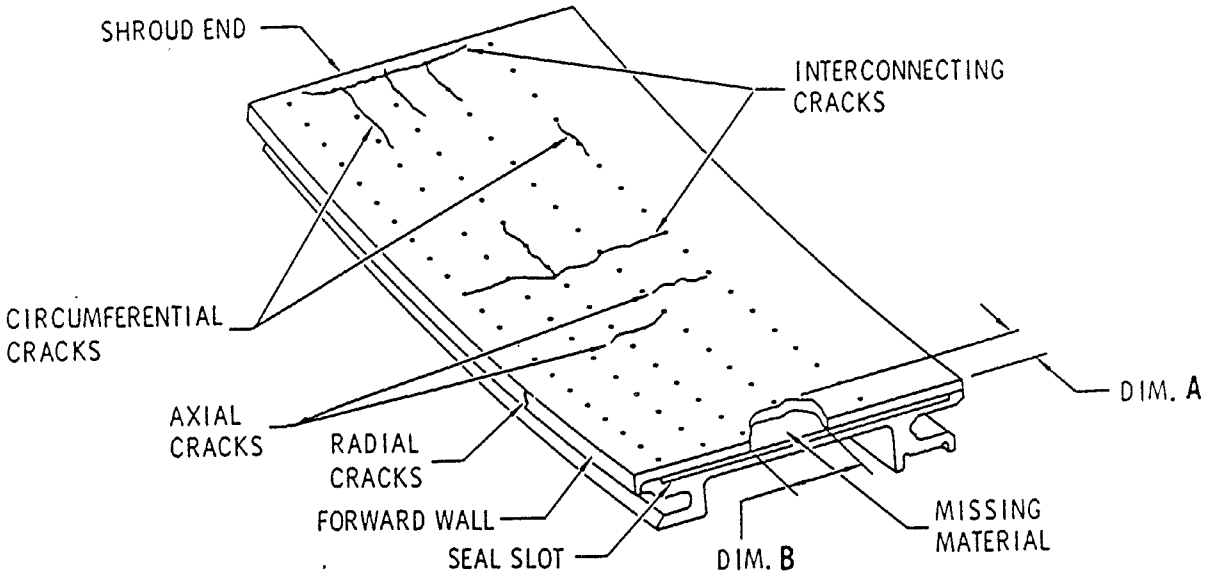


VIEW IN THE AFT DIRECTION OF THE CONVEX SIDE OF THE VANE

BM5 72 51 00 6 LAM0 02

1027317-02-A

Stage 1HPT Nozzle Vane Inspection
Figure 601



BM5 72 51 00 6 LCMO - 25 - 19
DM5

CF8–A6205–00–C

Stage 1 HPT Shroud
Figure 602

STAGE 2 HIGH PRESSURE TURBINE NOZZLE ASSEMBLY - INSPECTION/CHECK

1. General

Maintenance of the stage 2 high pressure turbine (HPT) nozzle is limited to inspection of those areas that can be examined externally or seen using a borescope. Stage 1 shroud segments are covered in 72-51-00.

2. Equipment and Materials

ITEM	DESIGNATION
A. 2C6388	Borescope Set, Fiber Light
Referenced Procedures	
- 72-00-00, P. Block 601	Engine - General
- 72-51-00, P. Block 601	First Stage HPT Nozzle Assembly

3. Visual Inspection/Check

A. Inspect HPT Active Clearance Control Manifolds (External Visible Areas) for:

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(1) Dents, nicks, and scratches	Not maximum limit	
(2) Cracks	No maximum limit up to 3.5 in. (89 mm) if no pieces are missing	

B. Examine HPT Case (External Visible Areas) for :

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(1) Surface cracks	Not serviceable	
(2) Bulges and dents	3 bulges or dents 0.5 in. (12.7 mm) diameter x 0.120 in. (3.0 mm) deep. No high metal allowed on flange mating surface	See limit extensions, (Ref. 72-00-00, P. Block 601)
(3) Nicks and scratches	Any number a maximum of 0.02 in. (0.51 mm) deep providing high spots are removed	See limit extensions, (Ref. 72-00-00, P. Block 601)
(4) Cracks from bolt holes in mounting flanges	4 holes cracked radially outward provided they are separated by	See limit extensions,

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
	5 bolt holes. None radially inward	(Ref. 72-00-00, P. Block 601)

4. Procedure
   (1) Remove borescope plug B3-2 (Ref. 72-00-00, P. Block 601) for port location.
   (2) Perform borescope inspection using borescope set 2C6388G06 or G07 (Equivalent substitutes may be used instead of the preceding items).
   (3) When inspection is complete, reinstall borescope plug (Ref. 72-00-00, P. Block 601).
   NOTE : For manual N2 rotor cranking (Ref. 71-00-00, P. Block 501).

5. Borescope Inspection/Check
   Inspect the following :
   NOTE : The general condition of the stage 2 HPT nozzle assembly can be determined by comparison with the condition of the stage one HPT nozzle assembly and the HPT rotor blades. Visual inspection by borescoping is limited to local areas adjacent to the borescope port only.
   Limits given are for those areas that can be observed.

A. Examine Vane Airfoil for : (Ref. Fig. 601)

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(1) Axial cracks in trailing edge more than 0.400 in. (10.16 mm) from inner and outer platforms	Any number, 0.090 in. (2.29 mm) long, 2 per vane, 0.50 in. (12.7 mm) long provided they are 0.250 in. (6.35 mm) apart, one per vane 0.75 in. (19.05 mm) long, or one per vane segment 1.25 in. (31.75 mm) long.	See limit extensions, (Ref. 72-00-00, P. Block 601).
(2) Cracks in trailing edge 0.40 in. (10.16 mm) or less from inner and outer platforms	Any number of cracks or craze cracking provided none extend more than 1.25 in. (31.75 mm) forward of aft edge. Also see limits defined for other areas of the airfoil outer fillet	See limit extensions, (Ref. 72-00-00, P. Block 601).
(3) Axial cracks in the leading edge more than 0.40 in. (10.16 mm) from the outer platform	One crack 0.50 in. (12.7 mm) long per airfoil. Cracks that do not break the surface layer are permitted with no quantity	See limit extensions, (Ref. 72-00-00, P. Block 601).

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
	limit.	
(4) Axial cracks in the concave surface more than 0.40 in. (10.16 mm) from the outer platform	Any number of cracks 1.50 in.) (38.10 mm) long. Material must not be lifted one side of the crack in relation to the other. Note: For the airfoil, 1.50 in. (38.10 mm) can be considered equivalent to half the distance lead to trail.	See limit extensions, (Ref. 72-00-00, P. Block 601).
(5) Cracks that extend axially on either the concave or convex airfoil or in leading edge 0.40 in. (10.16 mm) or less from the outer platform	Maximum cumulative length of axial cracking 3.00 in. (76.20 mm) per segmented pair. This limit includes any trailing edge cracking within 0.40 in. (10.16 mm) or less of the outer platform. No cracks are permitted in area C (see figure) in either airfoil. Note: At the outer fillet, 3.00 in. (76.20 mm) is equivalent to the distance lead to trail.	See limit extensions, (Ref. 72-00-00, P. Block 601).
(6) TBC spalling from the airfoil surfaces - for part numbers that have TBC coating	Any amount of spalling is permitted.	
(7) Nicks, scores, scratches or dents	Any number, 0.250 in. 6.35 mm) maximum length 0.030 in. (0.76 mm) deep	See limit extensions, (Ref. 72-00-00, P. Block 601).
(8) Bowing of trailing edge	Any number, 0.100 in. (2.54 mm) from original contour	See limit extensions, (Ref. 72-00-00, P. Block 601).
(9) Burns in convex and concave sides	One area 1 sq in. (6.45 sq cm) with no through holes	See limit extensions, (Ref. 72-00-00, P. Block 601).
(10)Burns or spalling on vane leading edge (charred only, no cracks	1.0 in. (25.4 mm) long radially, 0.250 in. (6.35 mm) wide per vane	See limit extensions, (Ref. 72-00-00,

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
or holes through airfoil		P. Block 601).
(11)Missing material in trailing edge	One piece, 0.150 in. (3.81 mm) by 0.150 in. (3.81 mm)	See limit extensions, (Ref. 72-00-00, P. Block 601).

B. Examine Inner and Outer Platform : (Ref. Fig. 601)

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(1) Cracks between vanes	Any number 0.150 in. long One crack, 0.60 in. (15.24 mm) in length, plus a second crack extending the distance between airfoils are permitted. Material lifting (one side of a crack relative to the other side) is permitted if lifting is less than the tickness of the platform.	See limit extensions, (Ref. 72-00-00, P. Block 601).
(2) Nicks, scores, scratches and dents on platform surfaces	Any number, 0.030 in. (0.8 mm) deep	
(3) Craze cracks	Any amount	
NOTE : Craze cracks are superficial cracks that do not break the coating surface.		
(4) Cracks in the outer and inner platform leading or trailing edges or mating face edges	Cracks less than 0.12 in. (3.05 mm) in length are permitted without a quantity limit. On the leading and trailing edges, two cracks less than 0.40 in. (10.16 mm) are permitted on each edge of each segment if the distance between cracks greater than 0.12 in. (3.05 mm) in length is at least 0.30 in. (7.62 mm). On the mating face edges, two cracks	See limit extensions, (Ref. 72-00-00, P. Block 601).

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
	extending into the airfoil fillet, but not beyond the fillet into the airfoil, are permitted if the distance between cracks is a minimum of 0.30 in. (7.62 mm).	
(5) TBC spalling from the outer platform - for part numbers that have TBC coating	Any amount of spalling is permitted.	

C. Examine Stage 2 Shroud Rub Surface for : (Ref. Fig. 602)

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(1) Wear	Any amount. No wear-through allowed	See limit extensions, (Ref. 72-00-00, P. Block 601).
(2) Erosion/ Rub marks	Any amount. No burn-through allowed	See limit extensions, (Ref. 72-00-00, P. Block 601).
(3) Axial cracks	Any number 0.20 in. (5.1 mm) long. Four cracks up to 1.0 in. (25.4 mm) long per segment. One crack per segment entirely across provided it is separated from other cracks by a minimum of 0.125 in. (3.18 mm).	See limit extensions, (Ref. 72-00-00, P. Block 601).
(4) Circumferential cracks	Four cracks per segment, up to 0.375 in. (9.53 mm) long, provided they are separated by a minimum of 0.125 in. (3.18 mm).	See limit extensions, (Ref. 72-00-00, P. Block 601).
(5) Interconnecting cracks	Any axial and circumferential cracks up to the maximum length limit per steps (3) and (4) is serviceable.	See limit extensions, (Ref. 72-00-00, P. Block 601).

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
	Limit is exceeded when any third crack connects except at shroud ends.	
(6) Missing material	An area up to 0.100 in. (2.54 mm) circumferentially X 0.75 in. (19.05 mm) axially to depth of seal slot may be missing from each circumferential end.	See limit extensions, (Ref. 72-00-00, P. Block 601).

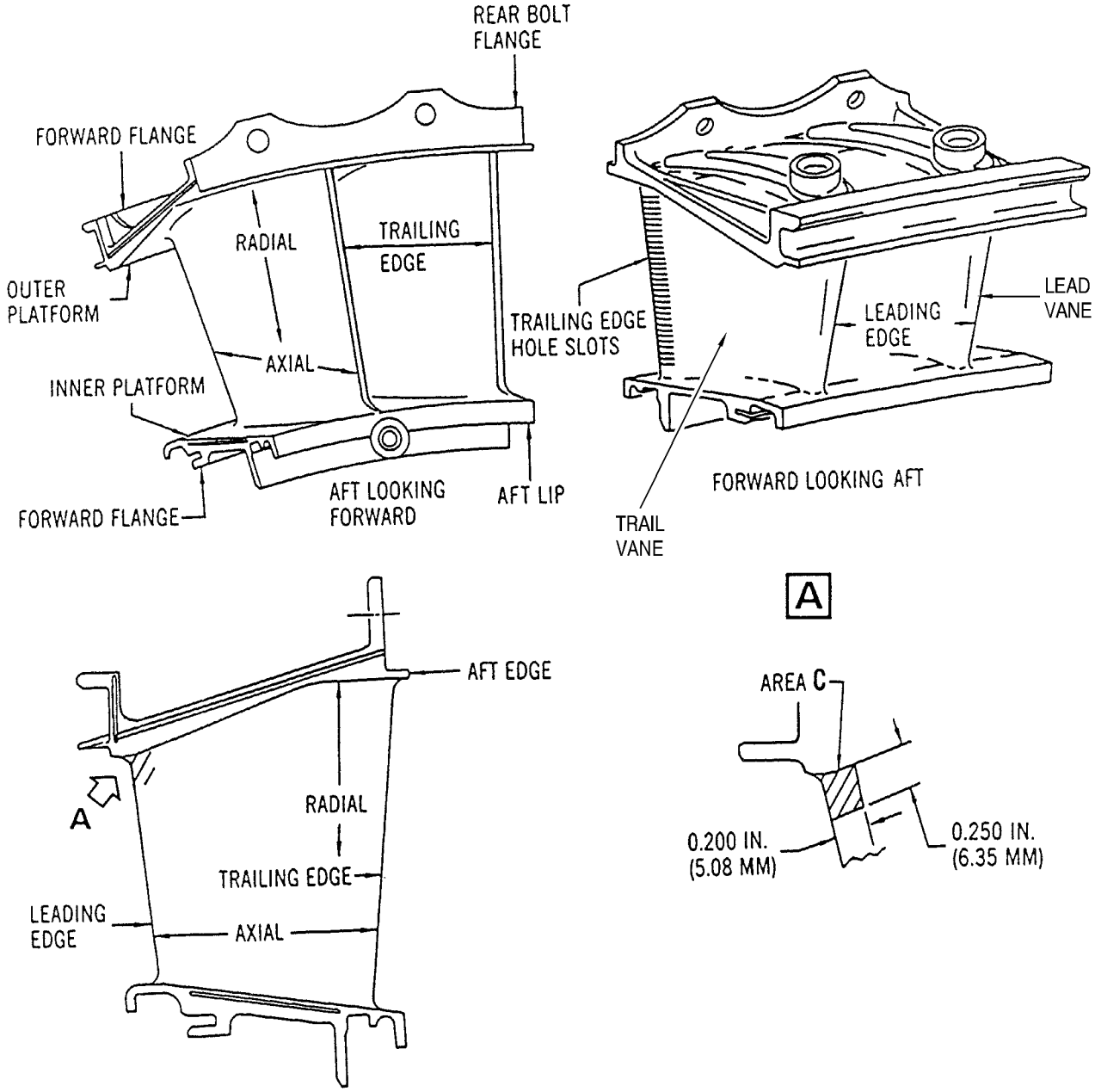
D. Examine Stage 2 HPT Nozzle for : (Ref. Fig. 603)

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(1) Disengaged or missing HPT stage 2 leaf seals	Any amount. Disengaged leaf seals can extend into the hot gas flowpath	If seen, borescope inspect the low pressure turbine within 25 flight cycles

NOTE : Liberated HPT leaf seals are occasionally found in the tailpipe. An HPT leaf seal is made of L605 material and is approximately 0.050 in. (1.27 mm) x 3.80 in. (96.5 mm) x 0.020 in. (0.51 mm). Leaf seals in the tailpipe are often bent to less than half of the original length.

NOTE : No action is required for 25 flight cycles for any liberated or disengaged HPT leaf seal issue.

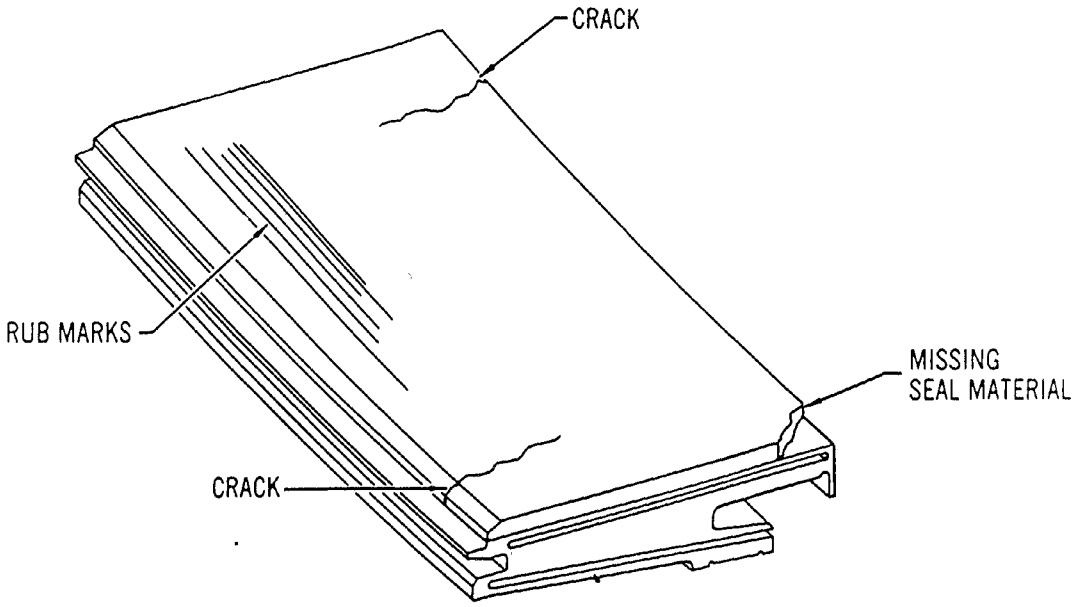
E. For Stage 1 Shroud Inspection, (Ref. 72-51-00, P. Block 601).



BM5 72 52 00 6 LAM0 01

CF8–A6171–01–A

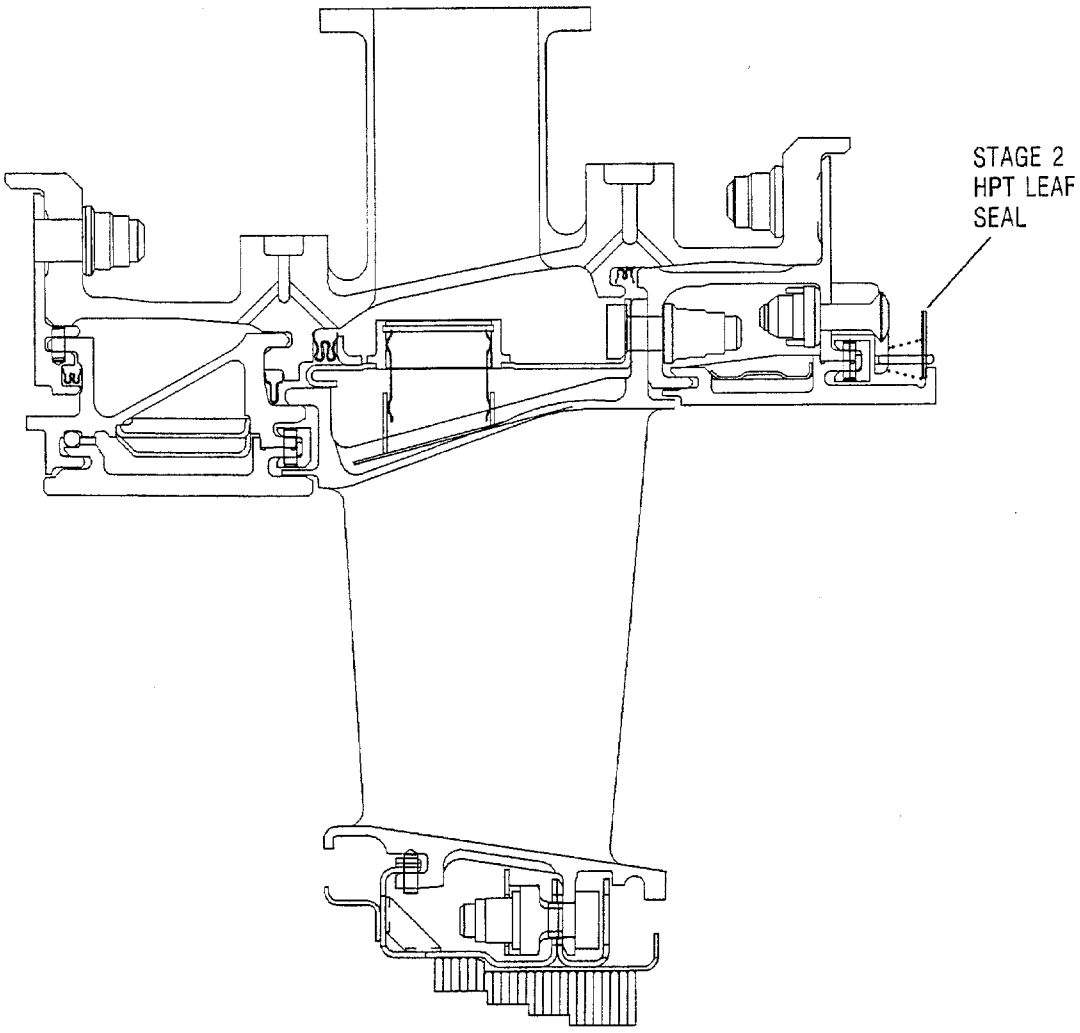
Stage 2 HPT Nozzle Inspection
Figure 601



BM5 72 52 00 6 LCMO - 25 - 19
DM5

CF8–A6172–00–C

Stage 2 HPT Shroud Segment
Figure 602



BM5 72 52 00 6 LEMO 00

Stage 2 HPT Leaf Seal Location
Figure 603

HIGH PRESSURE TURBINE ROTOR ASSEMBLY - INSPECTION/CHECK

1. General
   Maintenance of the high pressure turbine (HPT) rotor assembly is limited to inspection of those areas that can be seen with a borescope.

2. Equipment and Materials

ITEM	DESIGNATION
A. 2C6388	Borescope Set - Fiber Light
Referenced Procedure - 72-00-00, P. Block 601	Engine - General

3. Procedure

   A. Remove borescope plugs B3-1 and B3-2. (Ref. 72-00-00, P. Block 601) for port locations.

   B. Do a borescope inspection. Use the borescope set 2C6388G06 or G07. (Equivalent substitutes can be used as alternatives to the items that follow).

   C. When inspection is complete, install the borescope plugs (Ref. 72-00-00, P. Block 601).
      NOTE : For manual N2 rotor cranking (Ref. 71-00-00, P. Block 501).

4. Inspect the Following
   The limits that follow are for those areas that can be seen.

   A. Use a borescope and, examine first-stage high pressure turbine rotor blades for the following :
      (Ref. Fig. 601, 602, 603)
R   (Ref. Fig. 604, 605, 606)
      NOTE : This inspection applies to all blade configurations.
             The difference in blade configurations is as follows :
             Configuration 01 - (Pre SB 72-240) Original cooling hole pattern and blade Material DSR80H
             (Ref. Fig. 601).
             Configuration 02 - (SB 72-240) Cooling hole pattern changed and blade Material remained the same DSR80H
             (Ref. Fig. 602).
             Configuration 03 - (SB 72-306) Cooling hole pattern changed and blade Material changed to DSR142.
             (Ref. Fig. 603).
R   Configuration 04 - (SB 72-1288 and 72-1296) Cooling hole pattern
R   changed and new stage 1 HPTR blades incorporate a new tip shelf
R   feature to reduce tip temperatures (Ref. Fig. 604).
R   NOTE : The tip notches (Ref. Fig. 607, 608) can be found on the convex side of the four blades installed 90 degrees apart on the first

stage rotor.
The tip notches are for reference only.
Do not think it is blade tip erosion.
If you have a question, contact an Aircraft Engines Field Representative.

NOTE : During borescope inspection of blades, if you see plugged cooling holes, it is permitted. The blade must also be serviceable by the crack, erosion and burning limits.

NOTE : Crack indications you are not sure of can be sprayed with solvent to remove light surface engine deposits.

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(1)All areas for :		
(a)Codep coating or parent metal that is missing because of oxidation	Except on leading edge, no maximum limit if there are no holes or cracks in the oxidized area	
(b)Plugged cooling holes	No maximum limit	
(2)Leading Edge for :		
(a)Burns or parent metal oxidation	Permitted up to 0.30 in. (7.62 mm) in length (three cooling holes) if there are no holes or cracks in the burn area.	Reduce borescope inspection interval to 100 flight cycles if condition is seen. If condition is stable after two reduced inspection intervals, inspection intervals may be increased to 250 flight cycles maximum. See limit extensions, (Ref. 72-00-00, P. BLock 601).
(b)Axial and radial cracks in area A	None permitted if related to parent metal that is gone because of oxidation. No maximum limit to cracks related to impact damage if they do not go out of the leading edge	
(c)Radial cracks out of the leading edges holes in area B	No maximum limit if they do not connect three holes and do not turn in the axial direction	

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(d)Axial cracks in area B	Not permitted	
(e)Nicks and dents in area A	No maximum limit if the damage and the cracks do not go past the gill holes	
(f)Nicks and dents in area B	No maximum limit if the damage does not extend past the gill holes and is not related with tears, missing material, or cracks	
(g)Material that is gone	No maximum limit if the damage is less in diameter than the span between four leading edge holes or 0.36 in. (9.1 mm). The damage must not be below the seventh concave gill hole from the top. No cracks are permitted. The internal leading edge crossover wall must be intact. Only one sign of damage is permitted on each blade. Only two blades on each rotor set can be damaged	See limit extensions, (Ref. 72-00-00, P. Block 601)
(h)Coating that is gone with no burning or oxidation of the parent material	Permitted if there are no holes or cracks in the exposed parent material	

(3)Leading Edge/Tip Cap Area for :
(Ref. Fig. 607) (Detail B)
R (Ref. Fig. 608)

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(a)Material that is gone	Not permitted, no material that is gone or burn-through to the first radial passages	

NOTE : Any amount of leading edge tip wear is the result of a shroud that has moved down because it burned and/or melted.

(4)Trailing Edge for :		
(a)Cracks	Not permitted	

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(b)Nicks in area A	No maximum limit if there is no torn metal or cracks	
(c)Dents in area A	No maximum limit if the diameter is less than the span between four trailing edge holes or 0.120 in. (3.05 mm); and the depth is less than the width between two trailing edge holes or 0.040 in. (1.02 mm). The dent is not permitted to go into a trailing edge hole	
(d)Tears in area A	Not permitted	
(5)Concave and Convex Surfaces for :		
(a)Radial cracks at the gill holes and the film holes	No maximum limit if the crack does not connect three holes or does not turn in the axial direction. The crack length from the bottom hole must be less than the length between two holes	See limit extensions, (Ref. 72-00-00, P. Block 601)
(b)Radial cracks out of the tip film holes	Permitted, if they do not extend into the second film hole (in the direction of the platform). The radial cracks must not turn in the axial direction	See limit extensions, (Ref. 72-00-00, P. Block 601)
(c)Radial cracks in area A or B, other than at the gill or film holes	One crack is permitted. Its length must be less than the length between eight gill holes or 0.900 in. (22.86 mm). It must not touch the tip of the blade	See limit extensions, (Ref. 72-00-00, P. Block 601)
(d)Nicks and dents in area A	No maximum limit if there are no tears, cracks, or holes through the material	
(e)Nicks and dents in area B	The diameter length of the damage must be less than 0.120 in. (3.05 mm).	

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
	This is equal to two gill holes on the concave surface or four trailing edge holes on the convex surface. There must be no tears, cracks, or holes through the material. No damage is permitted on the root radius	
(f)Distortion, burns, and signs of melting	Not permitted	
(g)Axial cracks	Not permitted	See limit extensions, (Ref. 72-00-00, P. Block 601)
(h)Codep coating that is gone or parent metal oxidation	No maximum limit if there are no holes or cracks in effected area	
(6)Blade Tip Area (above the tip film holes) for : NOTE : It is possible that the tip film holes can extend into the blade tip area.		
(a)Radial cracks (can open up at tip and cause "V" notches)	Radial cracks are permitted on the concave side if they do not extend more than two holes below the tip film holes. Radial cracks are permitted on the convex side if they do not extend below trailing edge hole #2. Three radial cracks are permitted that extend to hole #4. The radial cracks can not be notched open below hole #1	See limit extensions, (Ref. 72-00-00, P. Block 601)
(b)Axial cracks	No maximum limit if the crack does not extend below tip film cooling holes	
(c)Bent or curled blade tips	No maximum limit if it does not extend below tip area	

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(d)Tears	No maximum limit if the tears do not go below the tip area	
(e)Material that is gone	No maximum limit if the damage does not extend below the tip area. You must not be able to see the internal air passages where the material is gone	
(f)Trailing edge material that is gone	No maximum limit if the damage does not extend below trailing edge hole #1 (see NOTE 1). You must not be able to see the internal air passages where the material is gone	

R NOTE 1 : (Ref. Fig. 605, 606)

B. Using Borescope, examine stage 2 HPT rotor blades for the following (Ref. Fig. 609, 610)

NOTE : This inspection applies to all blade configurations, unless specified otherwise.
Description of blade configurations is as follows :
Configuration 01 - (Pre SB GE 72-240) Original vent hole pattern of 2 rows of 6 holes.
(Ref. Fig. 609)
Configuration 02 - (SB GE 72-240) Changed vent hole pattern of 2 rows of 18 holes and an additional trailing edge row of 6 holes.
(Ref. Fig. 610).
Configuration 02 - (Post SB GE 72-518) Increased vent hole pattern on trailing edge row to 10.
Configuration 03 - (Post SB GE 72-910) Changed airfoil shape and changed vent hole pattern to two rows of 61 vent holes on the trailing edge (Ref. Fig. 611).
Configuration 03 - (SB GE 72-0903) is the same as GE SB 72-0910 but has less cooling holes.
Configuration 03 - (SB GE 72-1018) is the same as GE SB 72-0910 but has more cooling holes.

NOTE : Tip notches (Ref. Fig. 612) may be located on the concave side up to of four blades installed 90 degrees apart on the second stage rotor. The tip notches are for reference only and should not be interpreted as excessive blade tip erosion.
Should a question arise, contact a General Electric Field

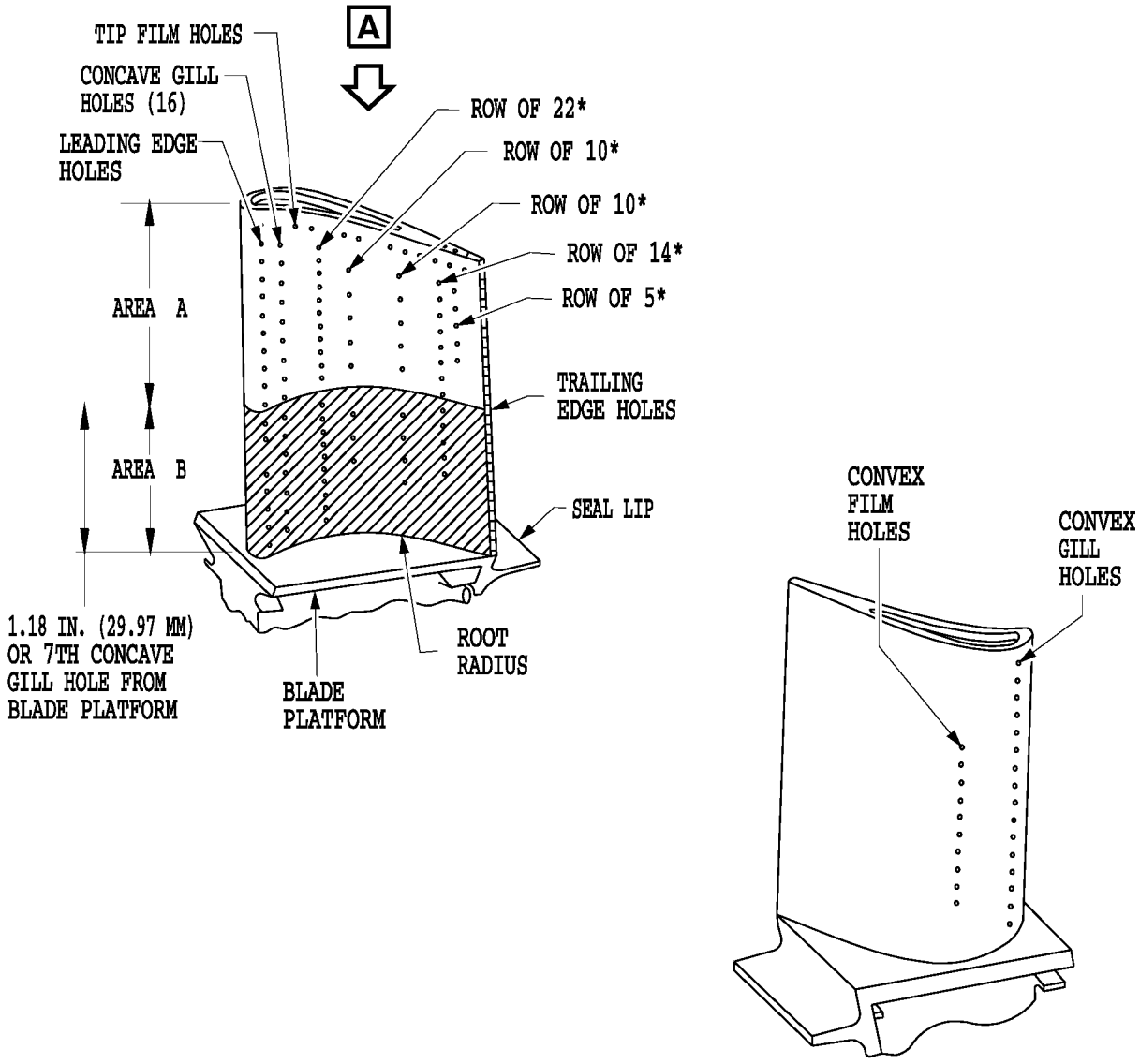
Representative.

NOTE : If you see an indication in the B3-2 BSI port that you are not sure of, use the B4-1 BSI port to make sure.

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(1)Concave and Convex Surfaces for :		
(a)Cracks	Not permitted	
(b)Tears and material that is gone	Not permitted	
(c)Configurations 01 and 02 : Dents and Nicks	Not permitted if it is less than 0.500 in. (12.70 mm) from the platform. Permitted in the other areas if less than 0.250 in. (6.35 mm) in diameter, and there is no torn metal	
(d)Configuration 03: Dents and Nicks	Not permitted if it is less than 0.500 in. (12.70 mm) from the platform. Permitted in the other areas if less than 0.500 in. (12.70 mm) in diameter, and there is no torn metal	
(e)Configurations 01 and 02 : Forward axial cracks from the last row of cooling vent holes	Permitted, one crack from each hole, if less than 0.100 in. (2.54 mm) long	
(f)Configuration 03: Cracks from any row of colling vent holes	Permitted, one crack for each hole, if less than 0.100 in. (2.54 mm) long ; must not connect trailing edge	
(g)Configurations 01 and 02 : manufacturing holes (Chaplet holes) missing braze material (Config 2 only)	Any amount	

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(h)Forward axial cracks from last row of cooling vent holes	One crack per hole up to 0.100 in. (2.54 mm) long	
(2)Leading edge area for :		
(a)Nicks and dents	No maximum limit	
(b)Cracks	No maximum limit in area A, if the crack is in a dent. Not permitted in area B	
(c)Configuration 02: Tears and material that is gone	Not permitted	
(d)Configuration 03: Material that is gone	Permitted in area A, for a radial length of 0.500 in. (12.70 mm), if the damage is in the first cavity from the leading edge only. The wall between cavities 1 and 2 must be fully intact. No axial cracks from the damage is permitted. Up to four blades on a rotor can be damaged. Upstream components should be inspected to determine the source of any liberated material.	See limit extensions (Ref. 72-00-00, P. Block 601)
(3)Trailing edge for :		
(a)Cracks	Not permitted	
(b)Nicks and dents	Not permitted, if less than 0.500 in. (12.70 mm) from the platform. Permitted in the other areas	
(c)Tears and material that is gone	Not permitted	
(4)Tip area for :		
(a)Bent or curled	No maximum limit	

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
blade tips		
(b)Missing metal and tears not exposing tip cavity shelf	Permitted	
(c)Radial cracks	Two radial cracks are permitted on each side of the blade tip if they are less than 0.250 in. (6.35 mm) in length. The cracks must not show the cavity that is below the tip cavity shelf	
(d)Axial cracks	Permitted if less than 0.500 in. (12.70 mm) in length	See limit extensions (Ref. 72-00-00, P. Block 601)
(5)All airfoil surfaces for :		
(a)Coating that is gone	No maximum limit	
(6)Platforms for :		
(a)Bowing	Permitted if mismatch does not permit the bottom edge of the platform to be seen	
(b)Radial cracks into the airfoil root radius from the platform edge	Permitted, if they do not go through the airfoil fillet and into the airfoil above the fillet	See limit extensions (Ref. 72-00-00, P. Block 601)



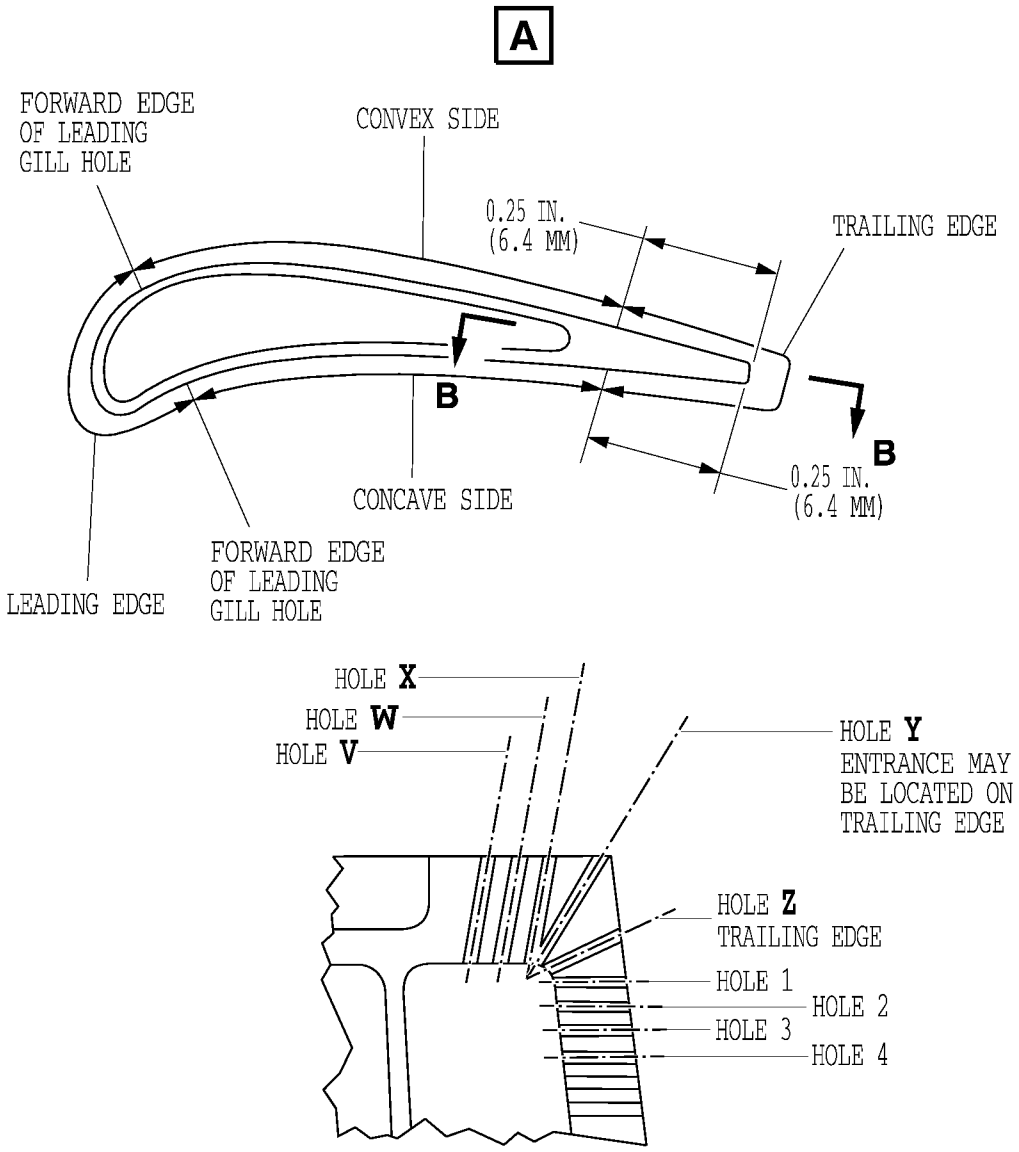
TYPE 1

1285247-00-A

BM5 72 53 00 6 LAMA 02

Stage 1 HPT Rotor Blade Inspection - Configuration 01
(Sheet 1/2)
Figure 601

R



SECTION B-B

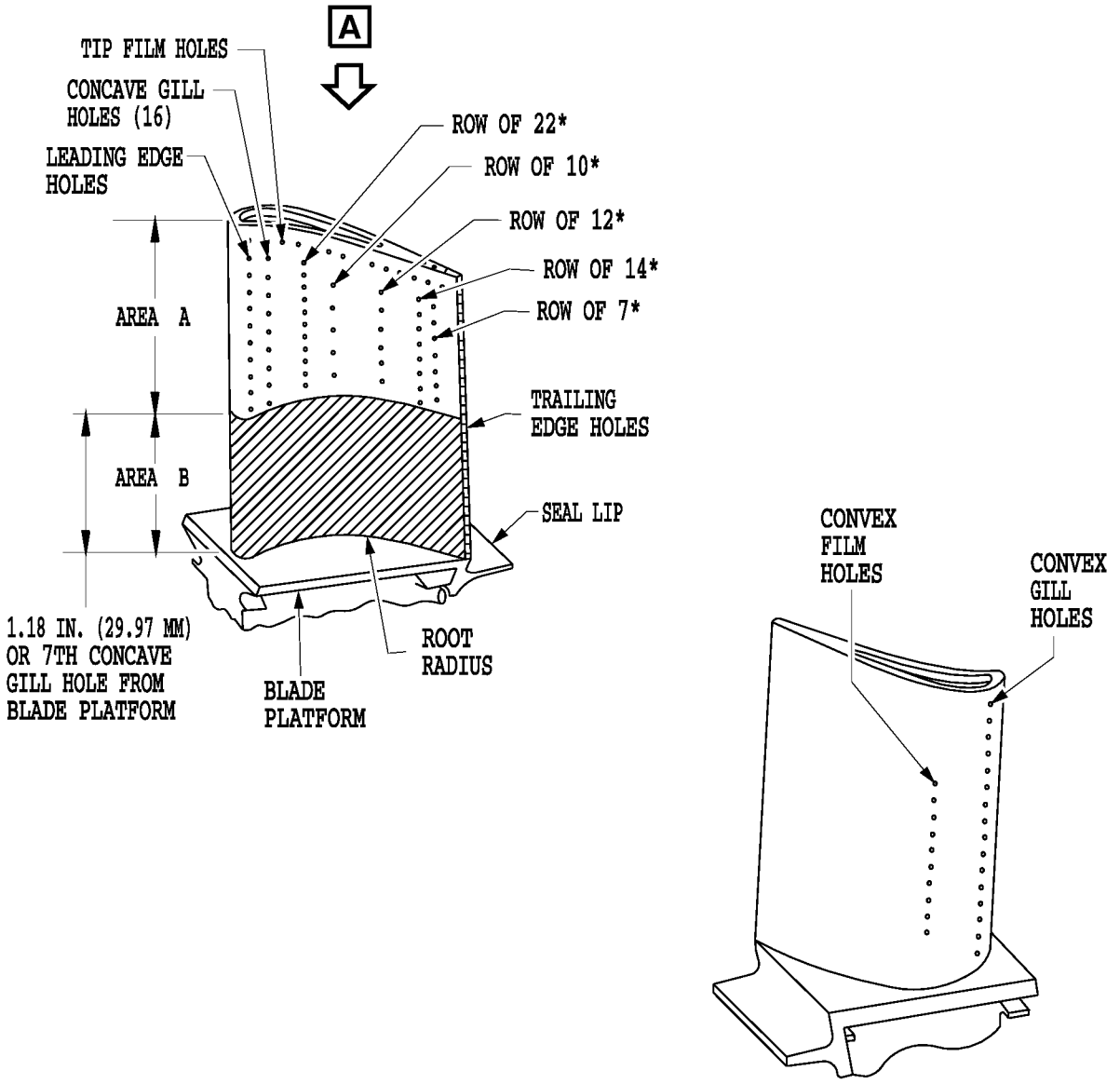
TYPE 1

1285248-00-A

BM5 72 53 00 6 LAMC 03

Stage 1 HPT Rotor Blade Inspection - Configuration 01
(Sheet 2/2)
Figure 601

R



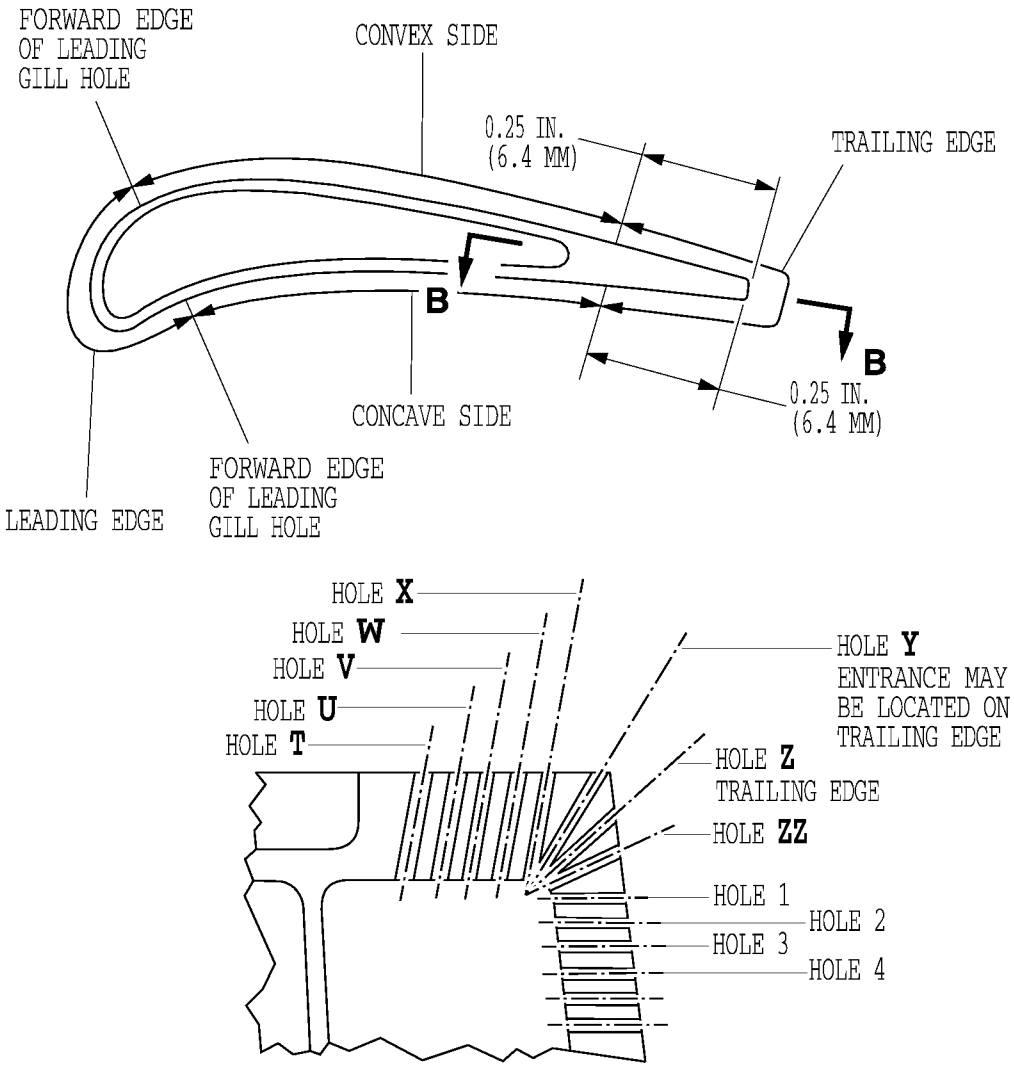
TYPE 2

1285249-00-A

BM5 72 53 00 6 LCMA 01

Stage 1 HPT Rotor Blade Inspection - Configuration 02
(Sheet 1/2)
Figure 602

R



SECTION **B-B**

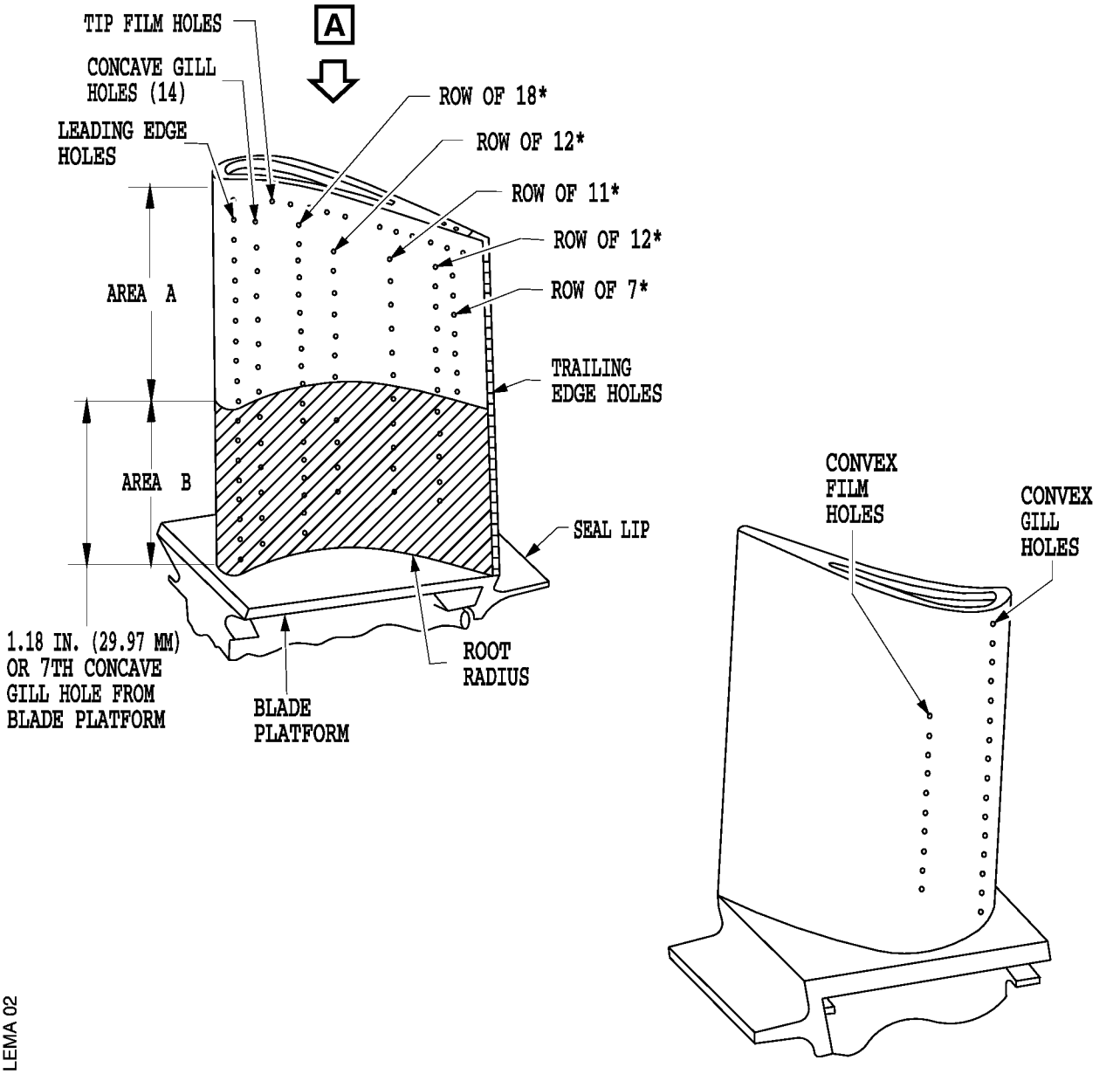
BM5 72 53 00 6 LCMC 02

TYPE 2

1285250-00-A

Stage 1 HPT Rotor Blade Inspection - Configuration 02
(Sheet 2/2)
Figure 602

R



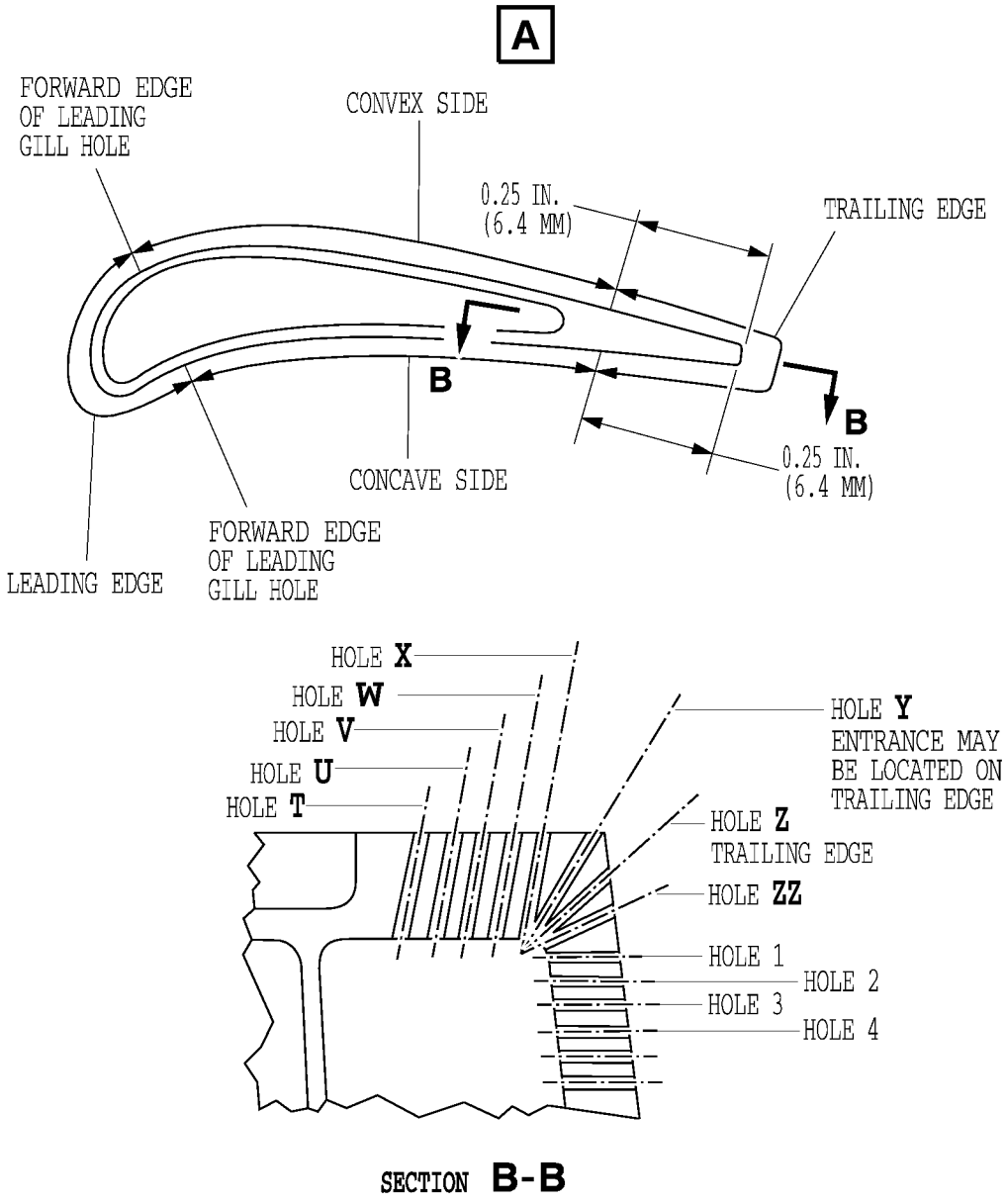
TYPE 3

1285251-00-A

BM5 72 53 00 6 LEMA 02

Stage 1 HPT Rotor Blade Inspection - Configuration 03
(Sheet 1/2)
Figure 603

R



SECTION B-B

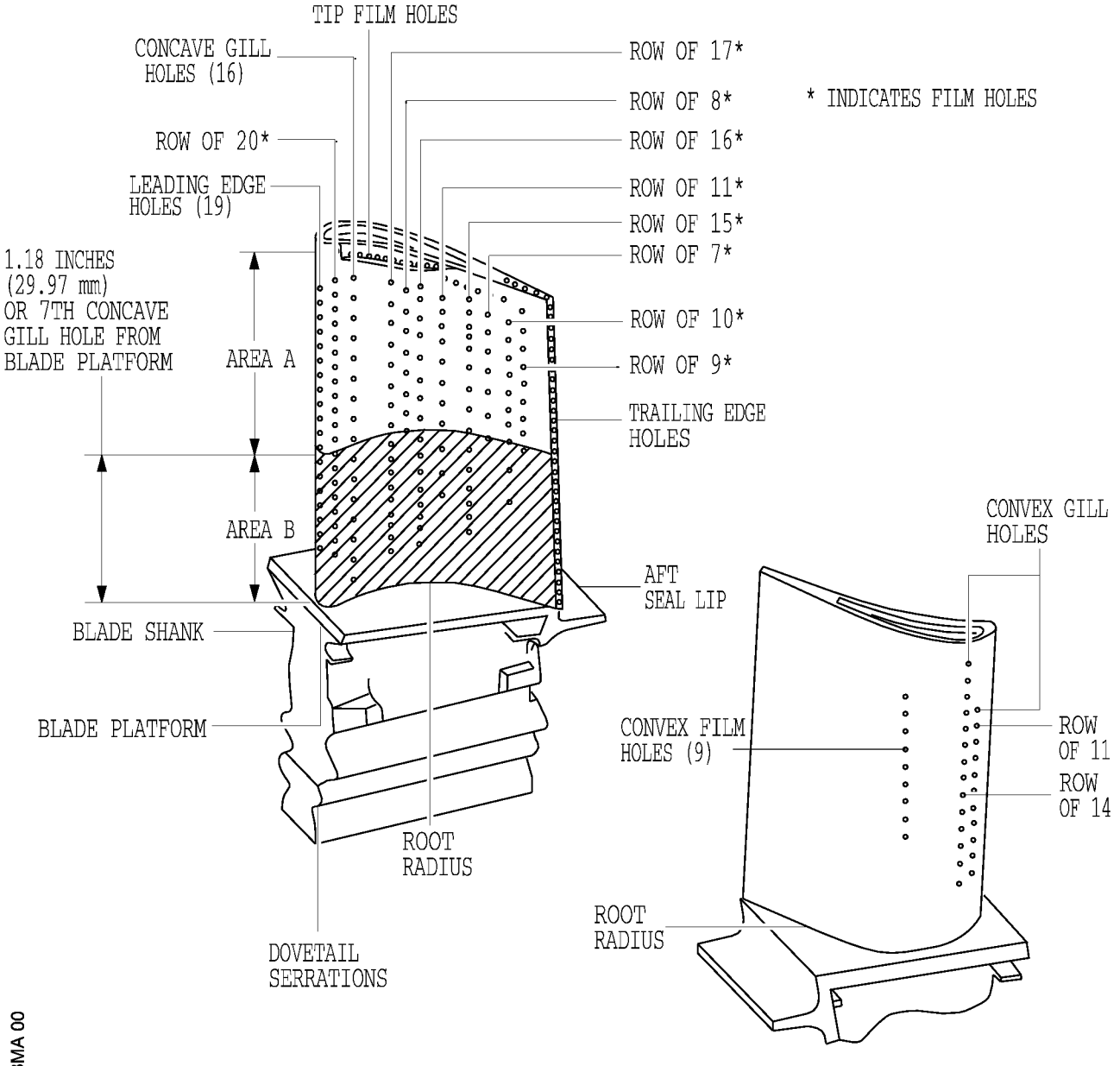
TYPE 3

1285252-00-A

BM5 72 53 00 6 LEMC 03

Stage 1 HPT Rotor Blade Inspection - Configuration 03
(Sheet 2/2)
Figure 603

R



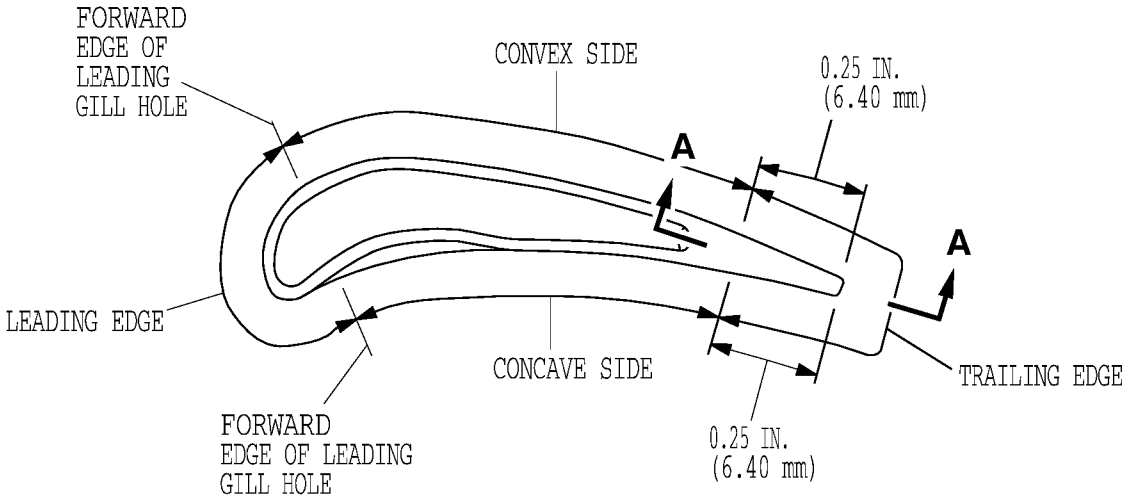
TYPE 4

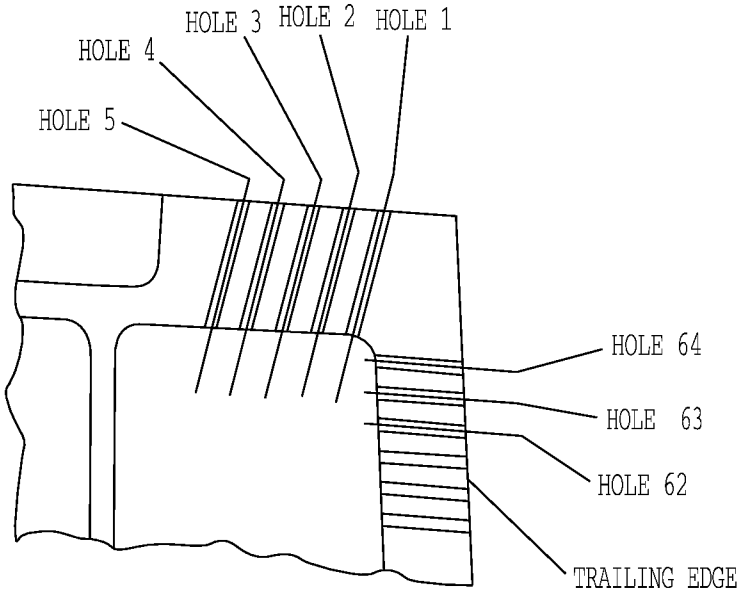
1281195-01-A

BM5 72 53 00 6 LBMA 00

Stage 1 HPT Rotor Blade Inspection - Configuration 04
(Sheet 1/2)
Figure 604

R





SECTION A-A

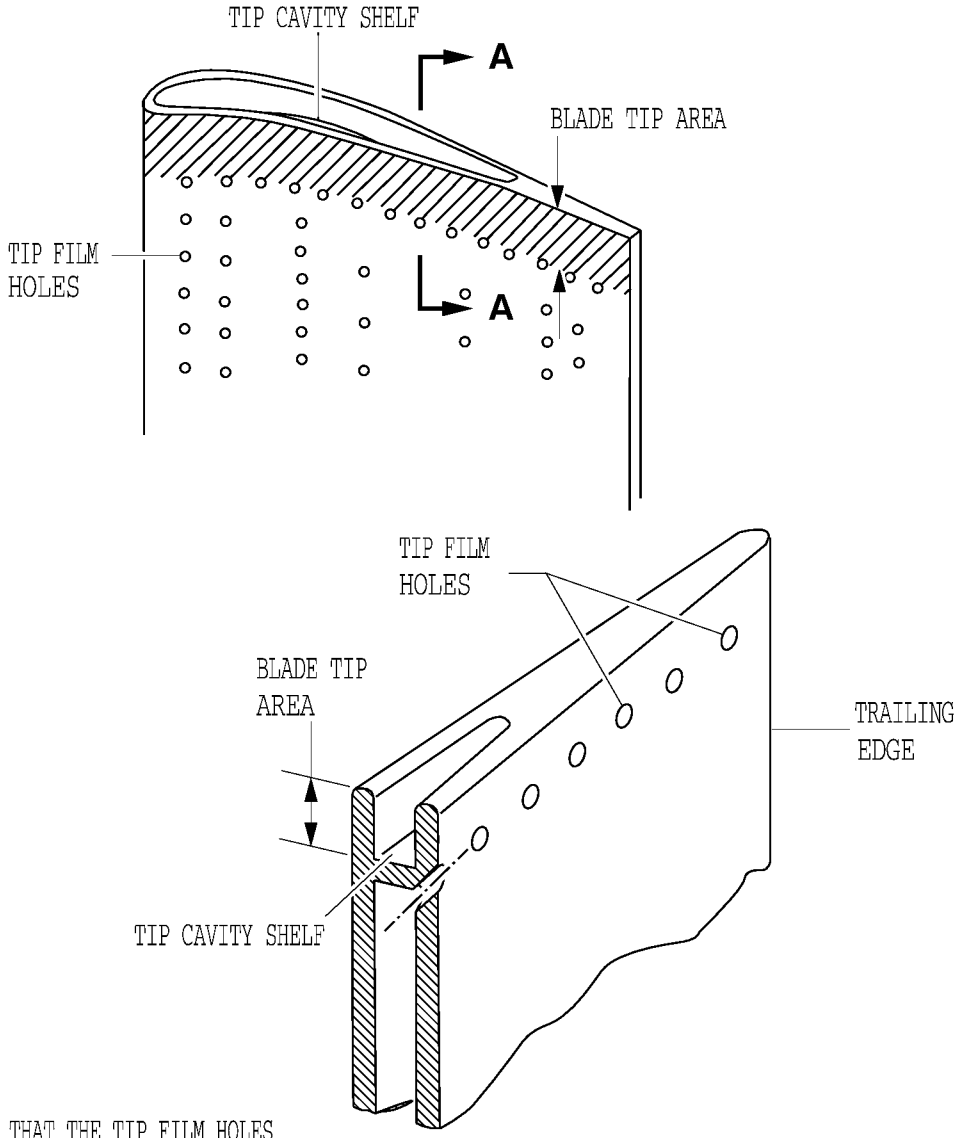
TYPE 4

1281391-01-A

BM5 72 53 00 6 LBMC 00

Stage 1 HPT Rotor Blade Inspection - Configuration 04
(Sheet 2/2)
Figure 604

R



NOTES:

1. IT IS POSSIBLE THAT THE TIP FILM HOLES CAN EXTEND INTO THE BLADE TIP AREA.
2. CENTERLINE OF THE TIP FILM HOLES IS AT THE SAME RADIAL HEIGHT AS THE TOP OF THE TIP CAVITY SHELF.

SECTION A-A

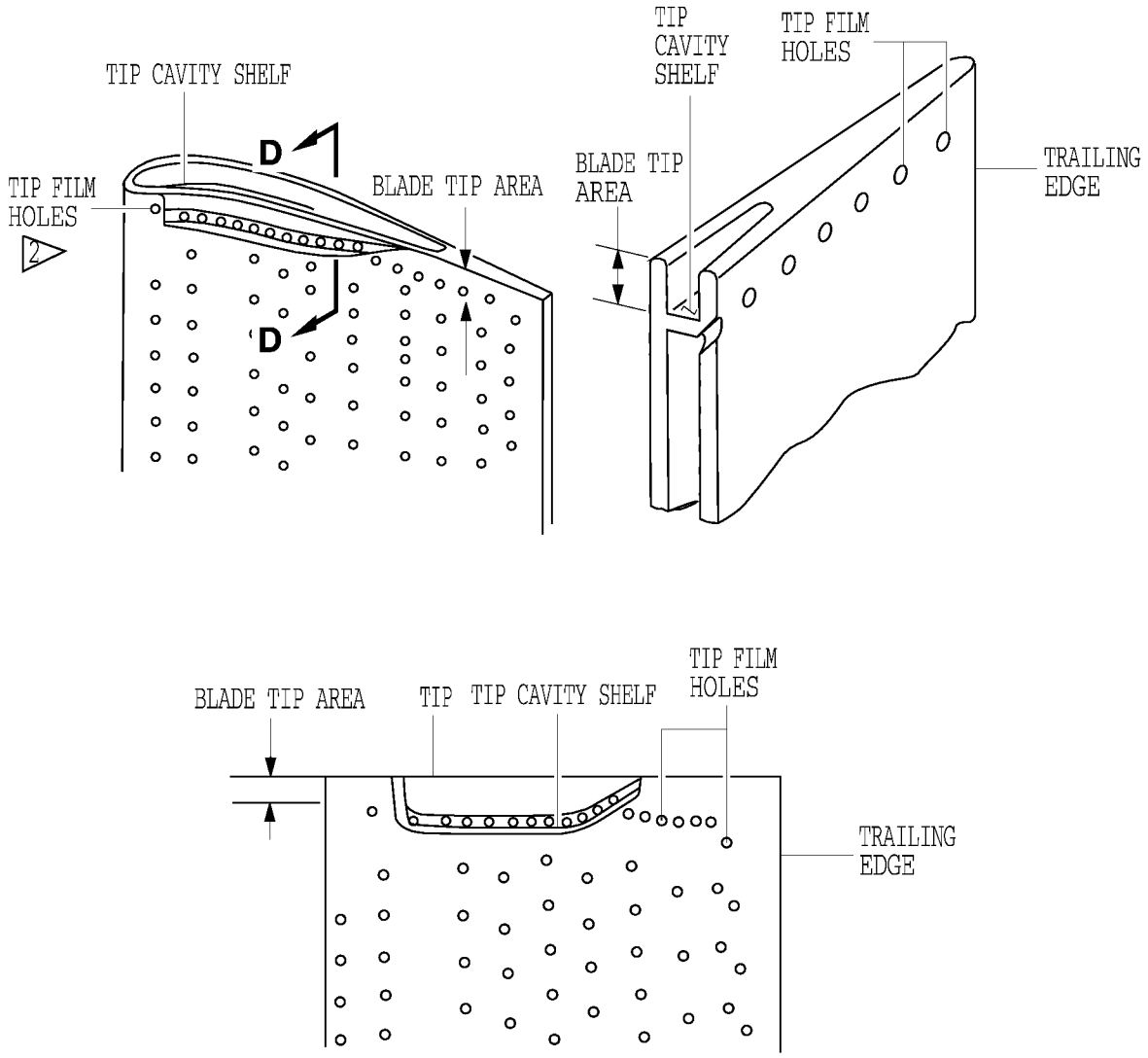
TYPE 1 THRU 3

1285253-00-A

BM5 72 53 00 6 LFM0 03

Stage 1 HPT Rotor Blade - Blade Tip Area -
Configurations 01 thru 03
Figure 605

R



BLADE TIP AREA - ALL CONFIGURATIONS

2 IT IS POSSIBLE THAT THE TIP FILM HOLES EXTEND INTO THE BLADE TIP AREA

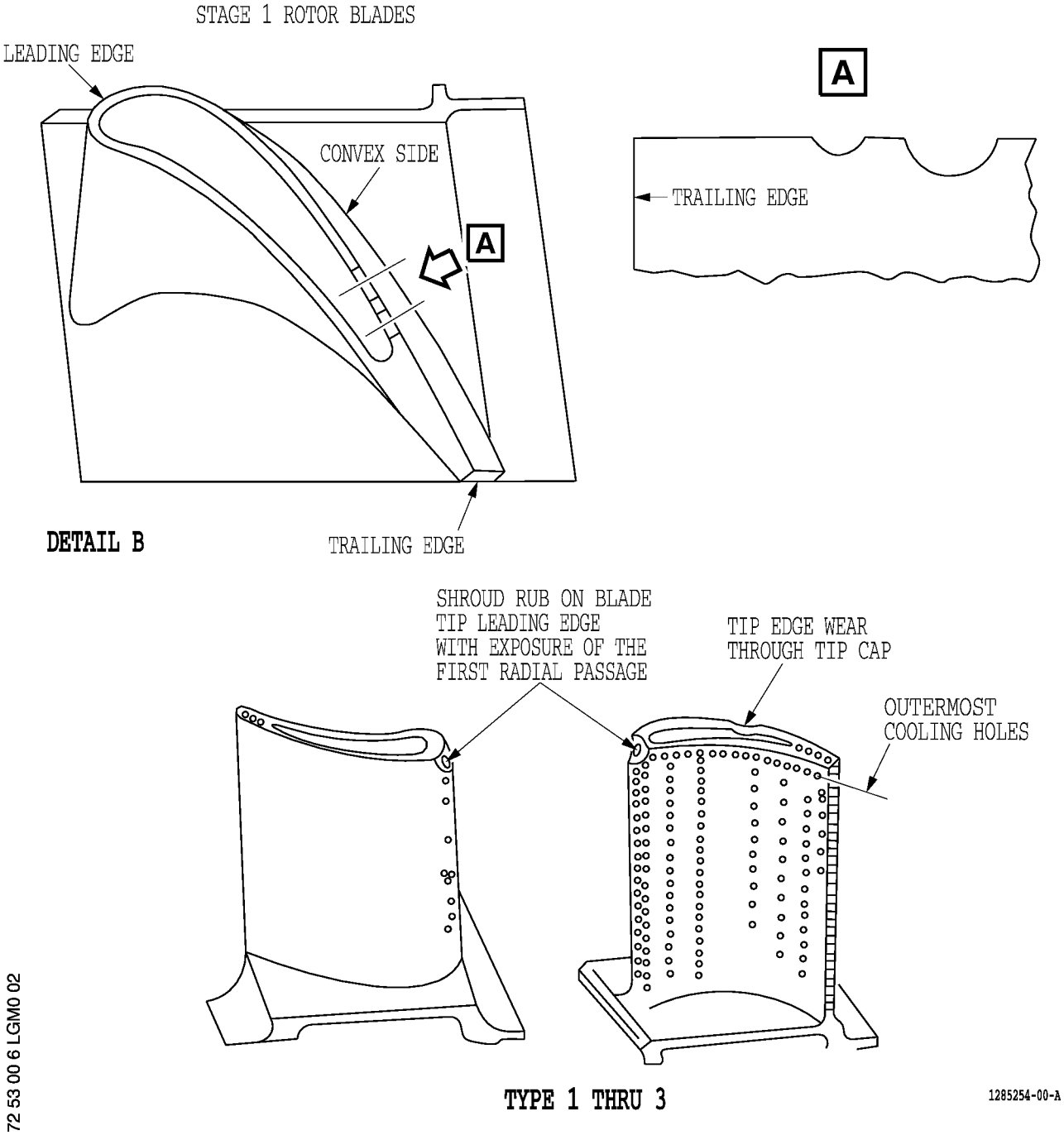
TYPE 4

1281197-00-A

BM5 72 53 00 6 LFN0 00

Stage 1 HPT Rotor Blade - Blade Tip Area - Configuration 04
Figure 606

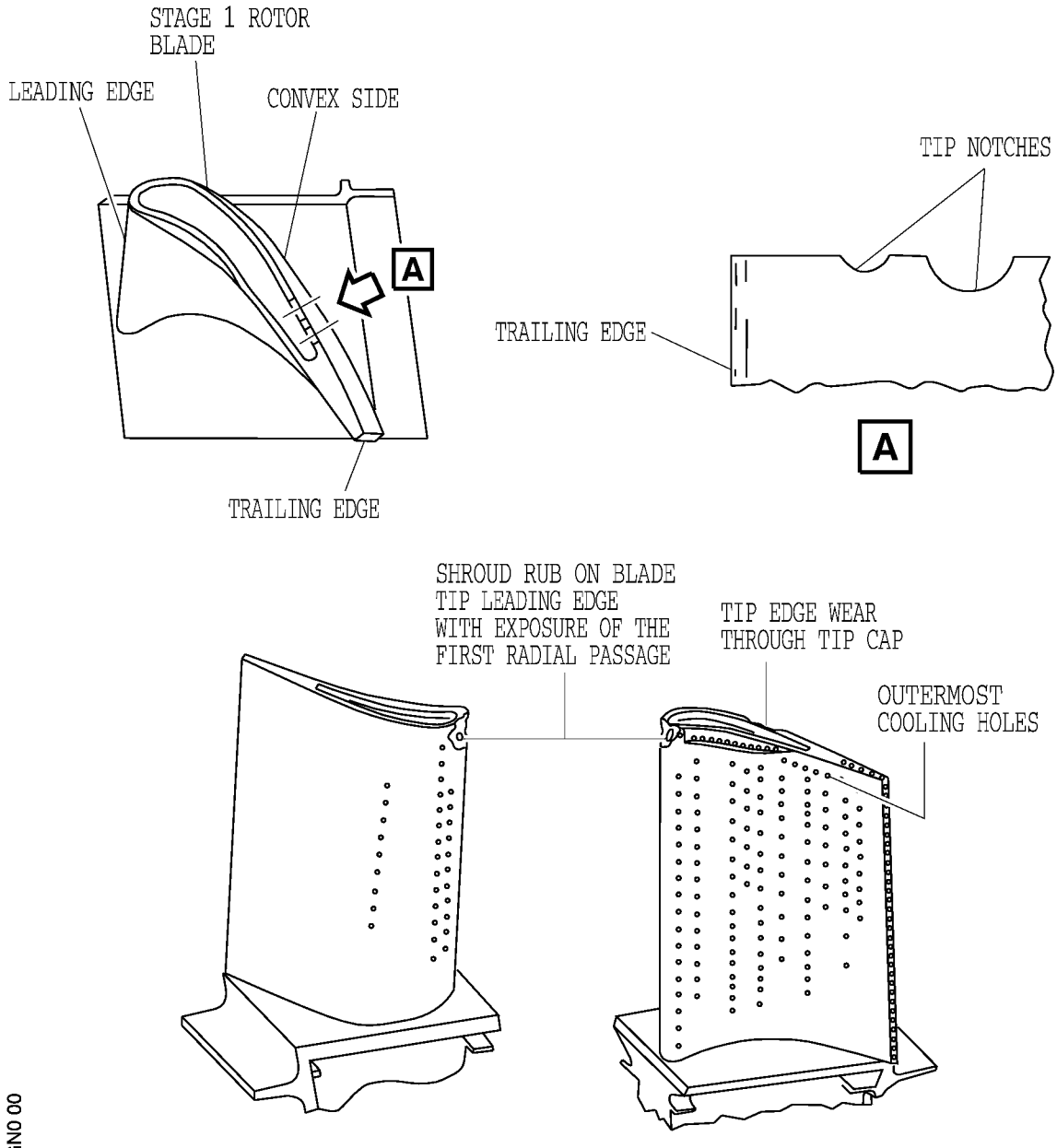
R



BM5 72 53 00 6 LGM0 02

Stage 1 HPT Rotor Blade Tip Notch Area -
Configurations 01 thru 03
Figure 607

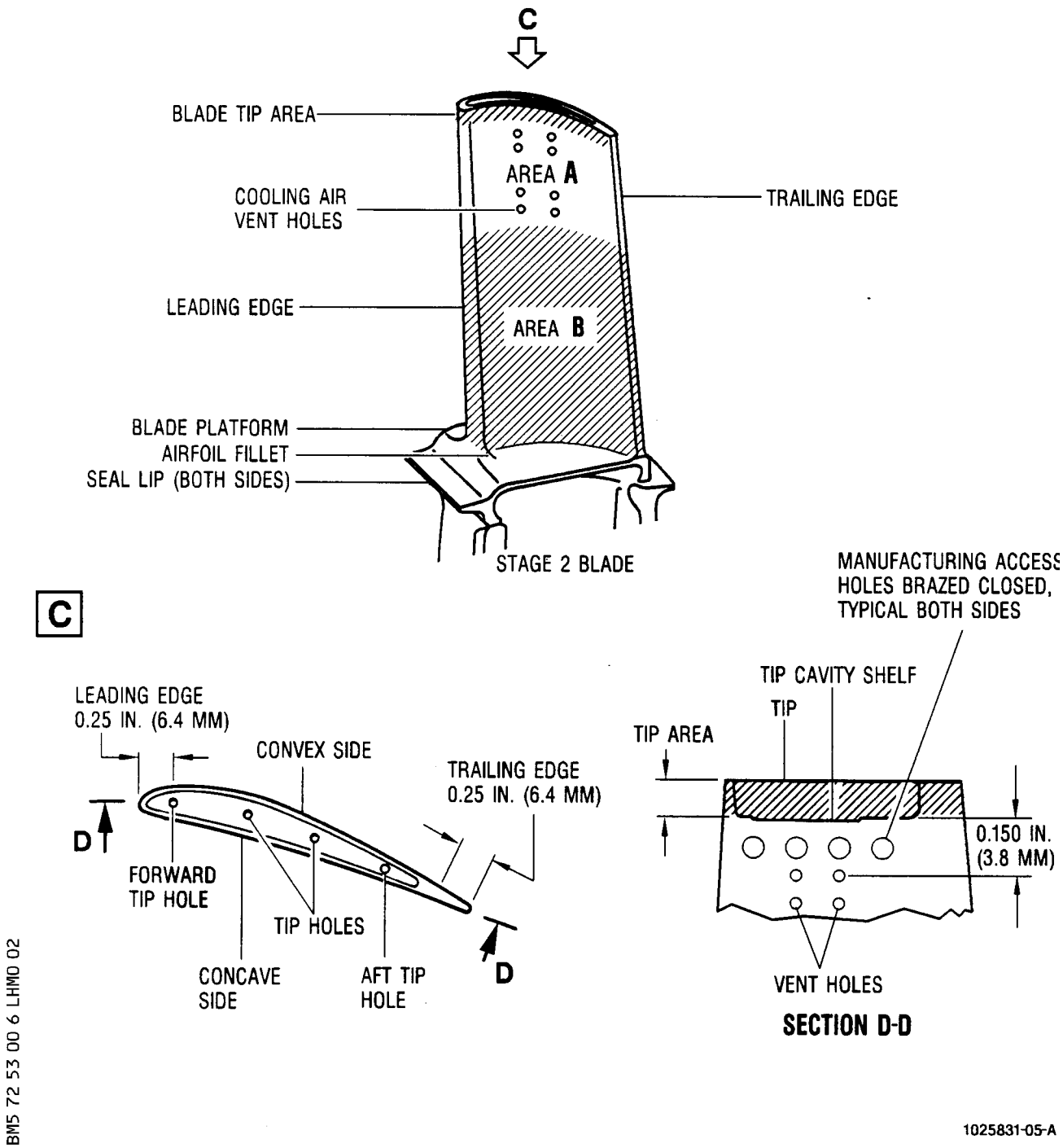
R



BM5 72 53 00 6 LGN0 00

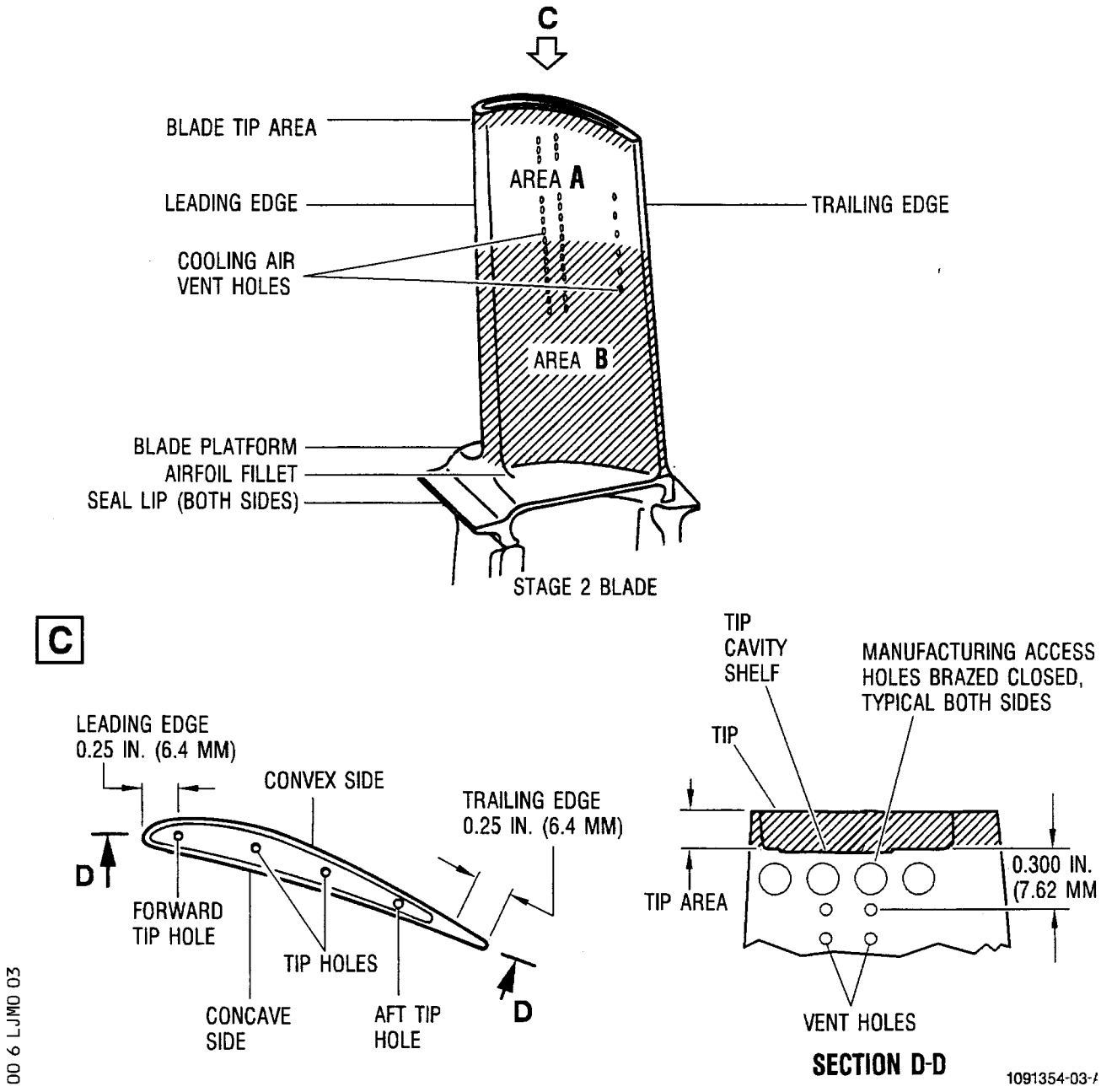
Stage 1 HPT Rotor Blade Tip Notch Area - Configuration 04
Figure 608

R



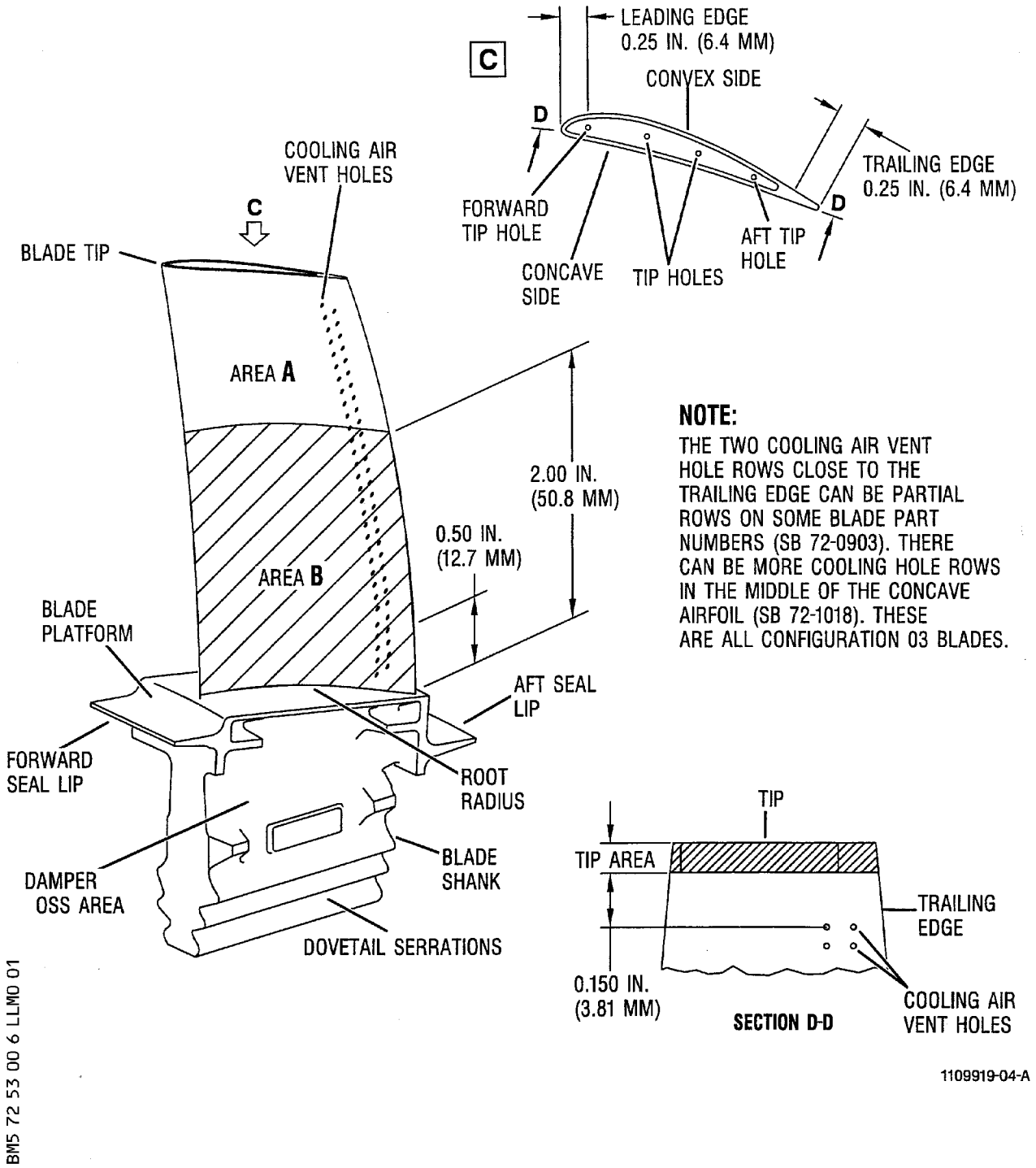
BM5 72 53 00 6 LHM0 02

Stage 2 HPT Rotor Blade Inspection - Configuration 01
Figure 609

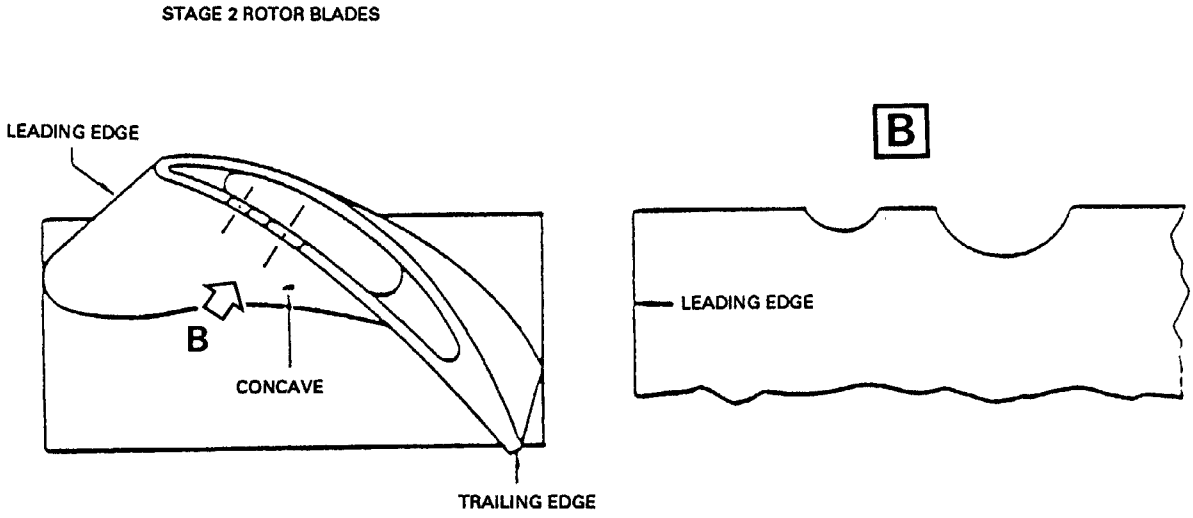


BM5 72 53 00 6 LJMO 03

Stage 2 HPT Rotor Blade Inspection - Configuration 02
(Post SB GE 72-240)
Figure 610



Stage 2 HPT Rotor Blade Inspection - Configuration 03
(Post SB GE 72-910)
Figure 611



BM5 72 53 00 6 LKMO - 00

CF8-A6208-00-C

Stage 2 HPT Rotor Blade Tip Notch Area
Figure 612

LOW PRESSURE TURBINE ASSEMBLY - INSPECTION/CHECK

1. General

A. Maintenance of the low pressure turbine (LPT) assembly is limited to those areas that can be examined externally or seen with a borescope through the borescope and exhaust gas temperature (EGT) probe ports in the turbine case.

B. The external seventh-stage manifold and the vane leading edge cooling circuit are the primary source for purge air to the high pressure turbine (HPT) stage 2 disk aft side and blade retainer, and to the LPT stages 1 and 2 disks.

C. Do a visual inspection of all cracks. If there are possible cracks, do a fluorescent-penetrant inspection to make sure (Ref. 70-00-00, P. Block 201). Unless differently noted, engine replacement is necessary if the damage is more than the maximum serviceable limits.

2. Equipment and Materials

ITEM	DESIGNATION
A. Material No.C02-058	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
B. Material No.C10-071	Miscellaneous (Ref. 70-00-00)
C. 2C6388	Borescope Set, Fiber Light
Referenced Procedures	
- 70-00-00, P. Block 201	Engine - Standard Practices
- 72-00-00, P. Block 601	Engine - General

3. Visual Inspection/Check

A. Examine the LPT case forward and aft flanges for : (Ref. Fig. 601)

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(1)Cracks that extend between bolt holes	Not serviceable	See the Over-Serviceable-Limit Extensions (Ref. 72-00-00, P. Block 601).
(2)Cracks that extend from bolt holes to the outer edge of the flange	Two cracks in each flange if they are not in adjacent holes	See the Over-Serviceable-Limit Extensions (Ref. 72-00-00 P. Block 601).
(3)Cracks in	Not serviceable	See the Over-

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
other areas of the flange		Serviceable-Limit Extensions (Ref. 72-00-00, P. Block 601).
(4)Nicks, scores, and/or scratches	Permitted if the depth is not more than 0.50 in. (12.7 mm) long, 0.01 in. (0.3 mm) after the removal of high metal with 1 in. (25 mm) minimum distance between the defects.	
R (5)Loose bolts	Not serviceable. Remove bolts and inspect the flange as shown below. Reinstall removed parts if serviceable. Apply anti-seize compound and TORQUE nuts to between 210 and 230 lbf.in. (2.4 and 2.6 m.daN).	See the Over-Serviceable-Limit Extensions (Ref. 72-00-00, P. Block 601).
R (6)Wear on exposed flange face under loose bolts (bolt removed)	Any amount up to a maximum depth of 0.030 in. (0.76 mm) if bolt and nut completely cover hole to seal air leakage. A maximum of two, non-adjacent hole locations are permitted.	See the Over-Serviceable-Limit Extensions (Ref. 72-00-00, P. Block 601).

B. Examine the LPT case body for : (Ref. Fig. 602)

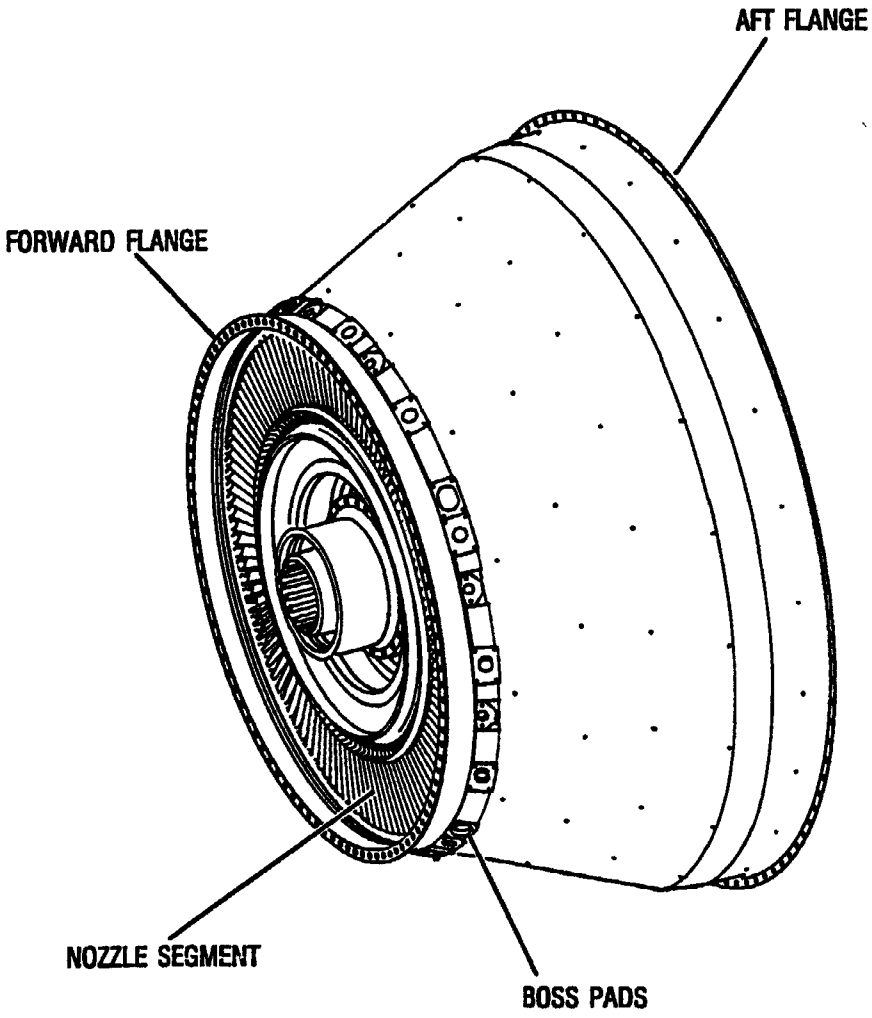
INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(1)Cracks in the parent metal	Permitted if not more than 0.130 in. (3.30 mm) long with 2 in. (51 mm) minimum distance between the cracks and no cracks fully through the parent metal	See the Over-Serviceable-Limit Extensions (Ref. 72-00-00, P. Block 601).
(2)Cracks in the welds	Four in each assembly if no more than 0.150 in. (3.81 mm) long with 2 in. (51 mm) minimum distance between	See the Over-Serviceable-Limit Extensions (Ref. 72-00-00, P. Block 601).

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
	the cracks. No cracks fully through are permitted	
(3)Cracks in the boss pads	Five in each case if not more than 0.25 in. (6.4 mm) in length	See the Over-Serviceable-Limit Extensions (Ref. 72-00-00, P. Block 601).
(4)Nicks and/or scratches	Permitted if the depth is not more than 0.01 in. (0.3 mm) after the removal of high metal	
(5)Smooth contour dents	Permitted if there is a smooth contour not more than 0.125 in. (3.18 mm) in depth	

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(6)Wear	Permitted if not more than these limits, at the locations that follow : (See NOTE) - 0.060 in. (1.52 mm) at W1 - 0.030 in. (0.76 mm) at W2 - 0.040 in. (1.02 mm) at W3 - 0.030 in. (0.76 mm) at W4. This is after the blend procedure. Blend wear areas to between 0.5 in. and 1.0 in. (13 and 25 mm) blend radius. It is possible to increase the wear and blend depths by 0.01 in. (0.3 mm).	See the Over - Serviceable - Limit Extensions (Ref. 72-00-00, P. Block 601

NOTE : (Ref. Fig. 602)

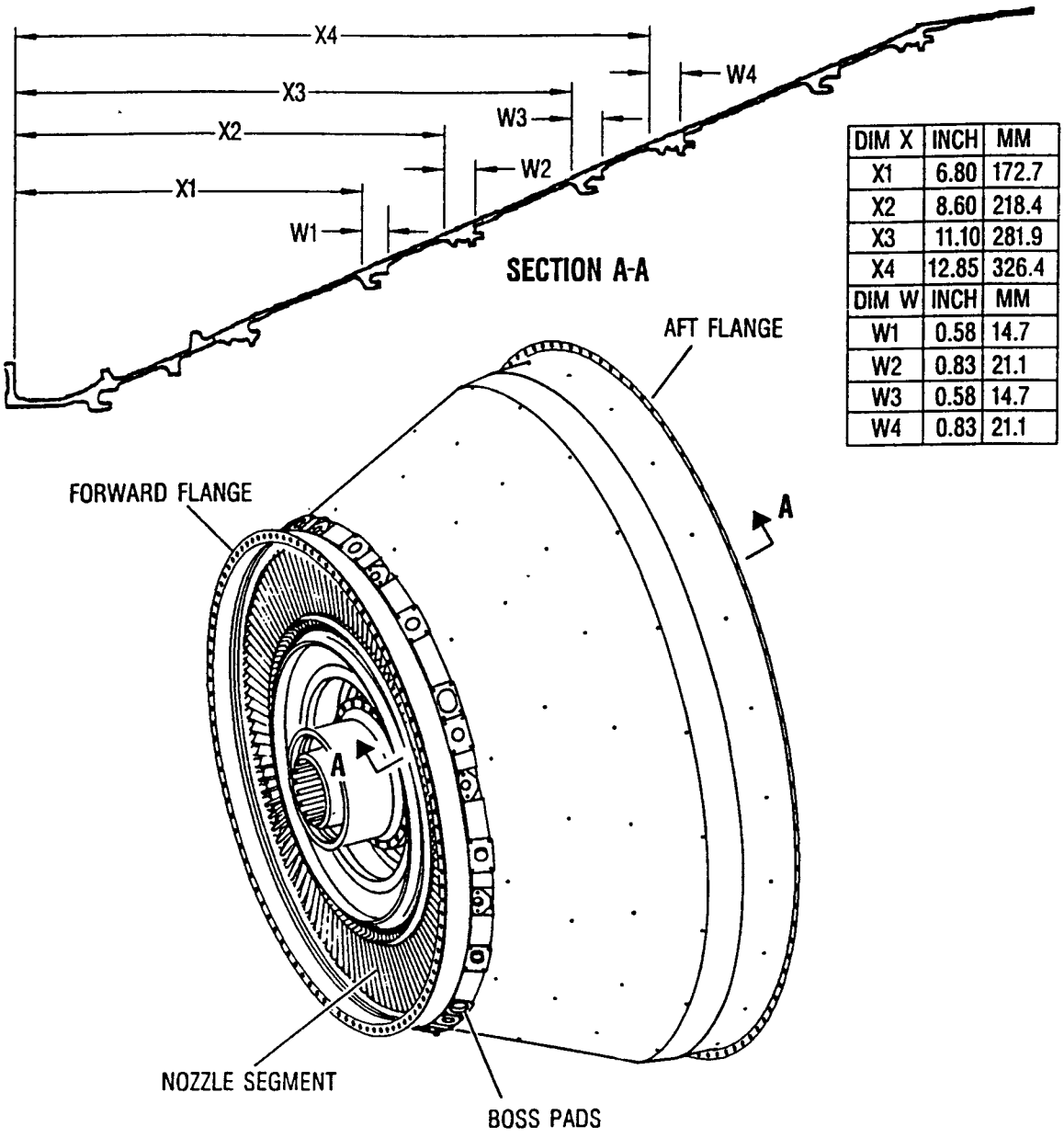
C. Examine the AU threaded borescope ports and bosses for :



1103011-00-A

BM5 72 56 00 6 LCMO - 00

Low Pressure Turbine Case - Inspection
Figure 601



DIM X	INCH	MM
X1	6.80	172.7
X2	8.60	218.4
X3	11.10	281.9
X4	12.85	326.4
DIM W	INCH	MM
W1	0.58	14.7
W2	0.83	21.1
W3	0.58	14.7
W4	0.83	21.1

1106540-00-A

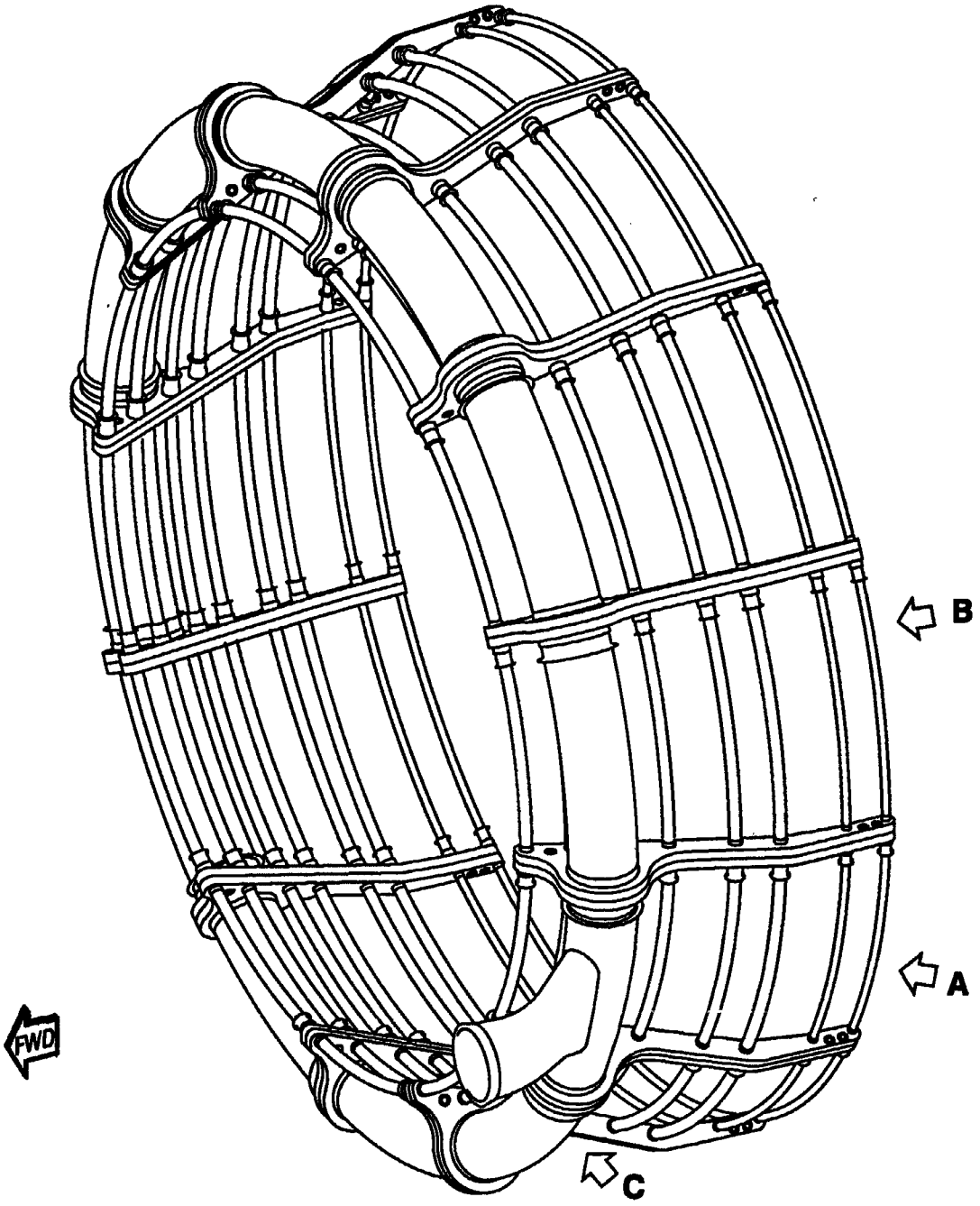
BM5 72 56 00 6 LDMO - 00

Low Pressure Turbine Case Body - Inspection
Figure 602

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(a)Damaged threads	One full-thread (and/or continuous) can be damaged after chasing threads	Chase the threads

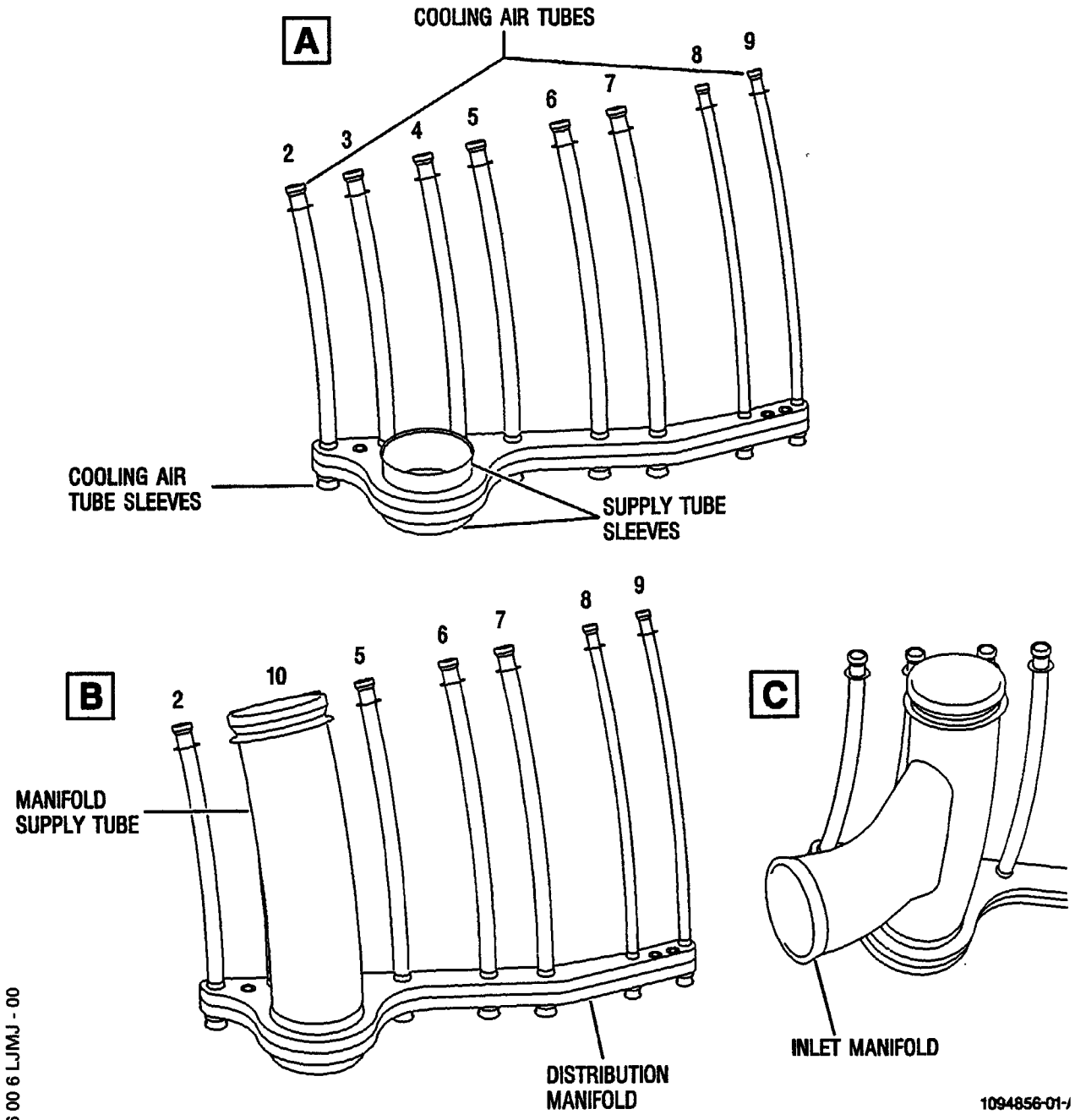
D. Examine the clearance control manifold for : (Ref. Fig. 603)

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(1)Inlet manifold, distribution manifold, and manifold supply tubes for :		
(a)Cracks	Permitted if not more than 3.0 in. (76 mm) long, with a total length not more than 8.0 in. (203 mm)	
(b)Dents, nicks scratches, and/ or flat areas	No maximum limit	
(c)Damage that is worn fully-through the cooling air tube or the supply tube	No wear-through is permitted	
(2)Cooling air tube sleeves and supply tube sleeves for wear-through	Maximum of 120 degrees if the tube(s) are still engaged with the sleeves	
(3)Cooling air tubes for :		
(a)Cracks	No maximum limit	
(b)Bends	Permitted if not more than 0.25 in. (6.4 mm) of the original contour	Use your hand to make adjustments up to 0.25 in. (6.4 mm) of the original contour, when possible
(c)Dents	Permitted if the depth is not more than 0.25 in. (6.4 mm)	



BM5 72 56 00 6 LJMA - 00

LPT Clearance Control Manifold (Sheet 1/2)
Figure 603



LPT Clearance Control Manifold (Sheet 2/2)
Figure 603

E. Examine the 7th-stage air manifold for : (Ref. Fig. 604)

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(1)Cracks in the feeder tubes and/or manifold	No cracks permitted	Replace cracked manifold and find if the engine is serviceable from the limits that follow :

TYPE OF CRACKS	NUMBER AND SIZE OF CRACKS	ENGINE SERVICEABILITY
Tangential (inboard end of elbow or in feeder tube tees)	No cracks permitted	Find if the engine is serviceable from the Special Inspection (Ref. 72-00-00, P. Block 601)
Radial (outboard end of air pad elbow or in feeder tube tees)	No cracks permitted	Find if the engine is serviceable from the Special Inspection (Ref. 72-00-00, P. Block 601)

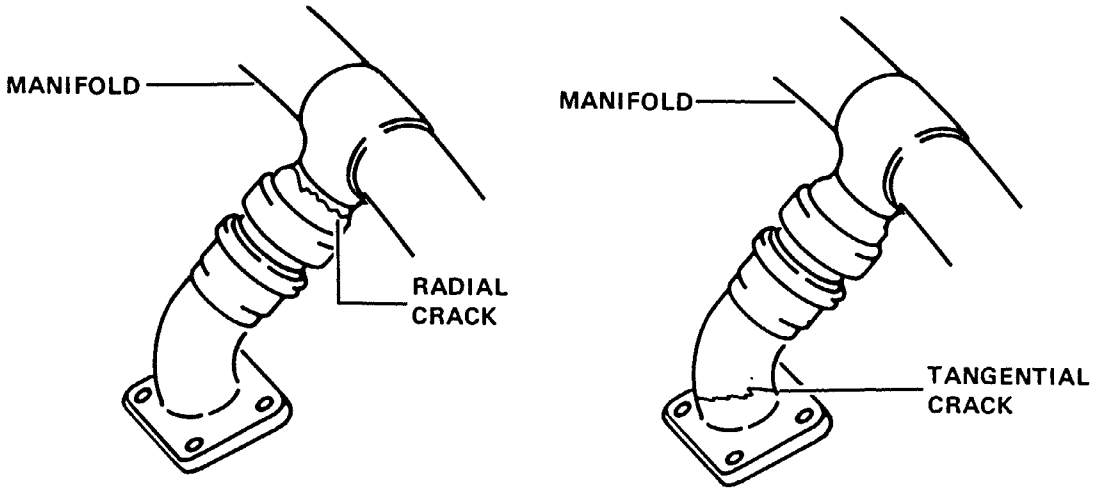
4. Borescope Inspection/Check (Ref. Fig. 605)

A. Procedure
(1)Remove the borescope plugs and the EGT and EPR probes (Ref. 72-00-00, P. Block 601) for ports locations.
(2)Do a borescope inspection with tools 2C6388G06 or 2C6388G07.
Do an inspection of visible areas of the stator vanes for :

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(a)Cracks	One in each vane 0.2 in. (5 mm) long in non-adjacent vanes	
(b)Nicks and/or dents	Permitted if metal is not torn	
(c)Burned areas and/or hot spots	One sq in. (6.45 sq cm) permitted if divided by 2 unburned vanes	
For Stage 1 Vanes only :		
(d)Tears	One in each vane segment if not more than 0.2 in. (5 mm) long	The vane leading edge cooling circuit is the primary source for purge air to the aft side of the stage 2 HPT disk

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
		rim. If this air flow is slowed or stopped, it can damage the stage 2 disk.
(e)HPT leaf seals in contact with EGT probe	Not serviceable	Remove probe to disengage leaf seal and inspect probe. Disengaged seal can stay in engine.
(f)HPT leaf seals wrapped around airfoils	Any number of occurrences is serviceable	

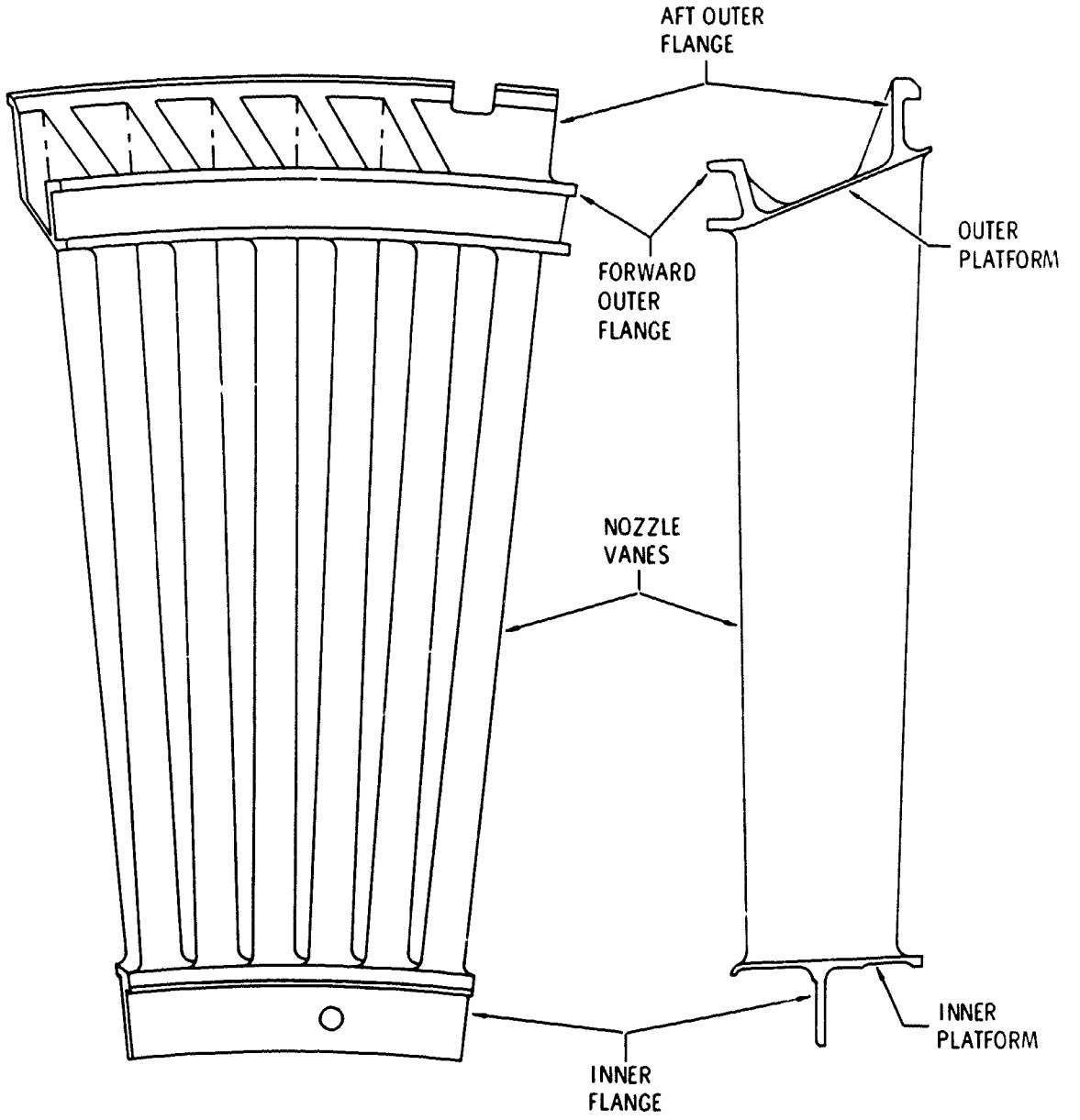
(3)Replace the probes and plugs. Lubricate with Material No.C02-058, replace, and tighten bolts and borescope plugs (Ref. 72-00-00, P. Block 601). Wirelock the plugs.



BM5 72 56 00 6 LAMO · 17 · 13
DM5

CF8-C3148-01-C

Air Pad Crack Examples
Figure 604



BM5 72 56 00 6 LEMO - 13 - 08
DM5

Typical Nozzle (Stage 3)
Figure 605

LOW PRESSURE TURBINE ROTOR ASSEMBLY - INSPECTION/CHECK

1. General

A. Maintenance of the low pressure turbine (LPT) rotor is limited to those areas that can be seen using a borescope, through the borescope ports in the LPT stator casing.

2. Equipment and Materials

ITEM	DESIGNATION
A. 2C6388	Borescope Set - Fiber Light
B. Material No.C10-071	Miscellaneous (Ref. 70-00-00)
C. Material No.C02-058	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
Referenced Procedures	
- 72-00-00, P. Block 601	Engine General
- 71-00-00, P. Block 501	Power Plant - General

3. Borescope Inspection/Check

A. Procedure

(1)Remove EGT probe pairs, EGT probes, or borescope plugs from the LPT case. (Ref. 72-00-00, P. Block 601 for port locations).

(2)Perform borescope inspection using tools 2C6388G06 or 2C6388G07.

(3)When inspection is complete, lubricate, replace, and tighten the borescope plugs, EGT probe pairs and EPR probes (Ref. 72-00-00, P. Block 601). Wirelock plugs.

B. Inspect the following

Visually inspect the LPT blades through the borescope ports.

NOTE : For manual N2 rotor cranking (Ref. 71-00-00, P. Block 501).

The following limits are those areas which can be seen (Ref. Fig. 601)

Parts that exceed serviceable limits must be replaced.

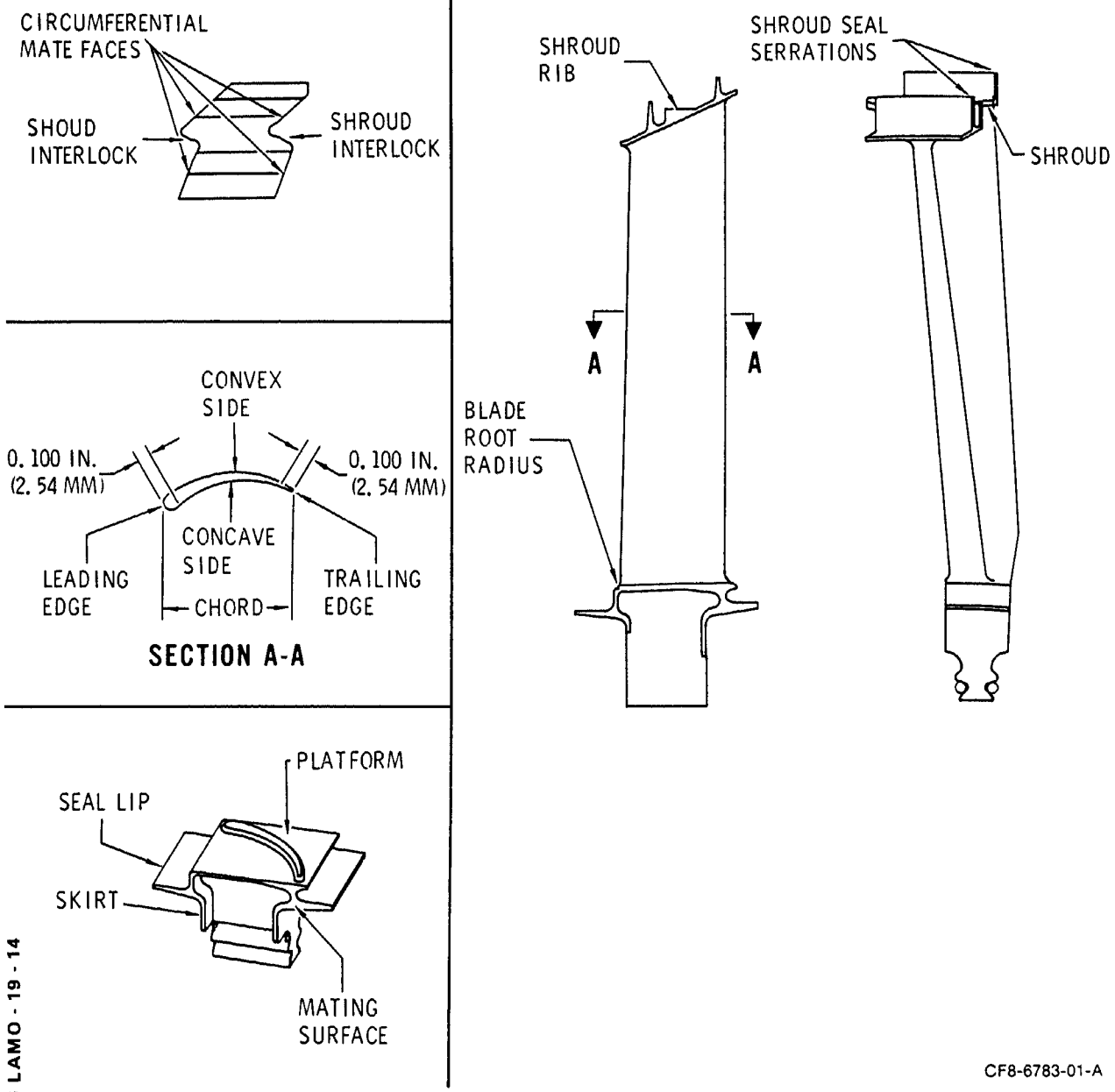
(1)Inspect blades, all stages.

NOTE : (Ref. Fig. 603, 604) apply to paragraphs 3.B.(1) (e) 1 and 3.B.(1) (f) 1, 2 and 3.
(Ref. Fig. 602) applies to paragraphs 3.B.(1) (c) 2.

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(a)All Areas for :		
1 Cracks	Not serviceable	
2 HPT leaf seals wrapped around airfoil	Not serviceable	Disengage the leaf seal from the blade and inspect the blade. Disengaged seal can stay in the engine.

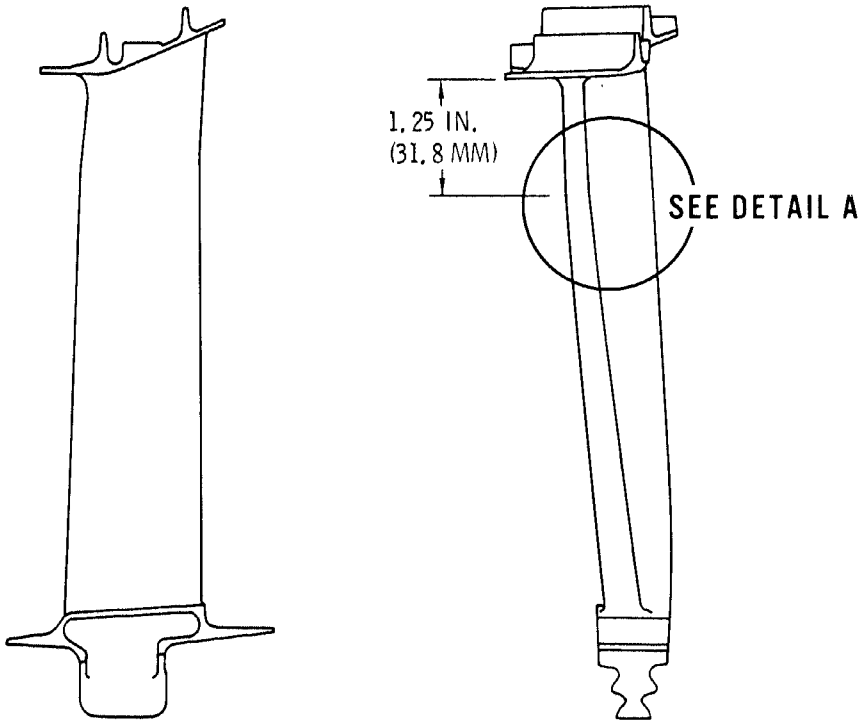
INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
		See limit extensions Ref. 72-00-00, P. Block 601.
NOTE : Liberated HPT leaf seals are occasionally found in the tailpipe. An HPT leaf seal is made of L605 material and is approximately 0.050 in. (1.27 mm) x 3.80 in. (96.5 mm) x 0.020 in. (0.51 mm). Leaf seals in the tailpipe are often bent to less than half of the original length.		
(b)Leading and Trailing Edges for :		
R 1 Nicks	Any number, 0.040 in. (1.02 mm) deep	For missing material, see the over limit extensions (Ref. 72-00-00, P. Block 601)
2 Dents	Any number with no protrusions on opposite side, five per airfoil with protrusions on opposite side not exceeding 0.050 in. (1.27 mm)	
(c)Concave and Convex Surfaces for :		
1 Nicks and dents	Any number 0.030 in. (0.76 mm) deep, minimum separation 0.250 in. (6.35 mm) with no protrusions on opposite side. 5 dents per side with maximum protrusions of 0.020 in. (0.51 mm) on opposite side	
2 Stage 1 airfoil contours with distinct angular transition in contour (see figure)	Any amount	
(d)Top Surface of Blade Platform (not including blade root radius) for :		
1 Nicks and dents	Any number, 0.020 in. (0.51 mm) deep	
(e)Shroud Circumferential Mate Faces for :		
1 Wear (irregular or jagged, see figures)	Any amount provided there is no associated interlock wear	
(f)Shroud Interlocks for :		
1 Wear, with loss of axial preload (See figures)	Not serviceable, if there is no axial preload	See limit extensions Ref. 72-00-00, P. Block 601
2 Shingled or unlatched (See figures)	Not serviceable, if interlocks can be unshingled or relatched with axial preload present, then blades are serviceable.	See limit extensions Ref. 72-00-00,

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
		P. Block 601
3 Wear (irregular or jagged, see figures).	Not serviceable	
(g)Shroud for : (Stages 3, 4 or 5 only)		
1 Radial Mismatch	Any amount as long as the mismatch is not greater than the thickness of the shroud at the mating surface (Ref. 0.04 in. (1.02 mm))	

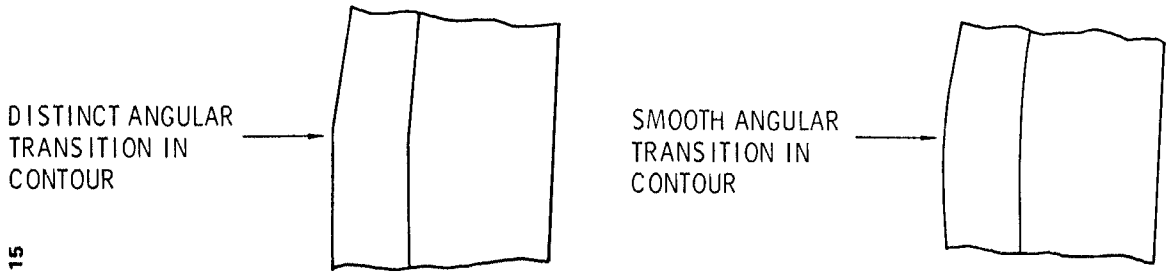


BM5 72 57 00 6 LAMO - 19 - 14
DM5

Typical Low Pressure Turbine Rotor Blade
Figure 601



DETAIL A

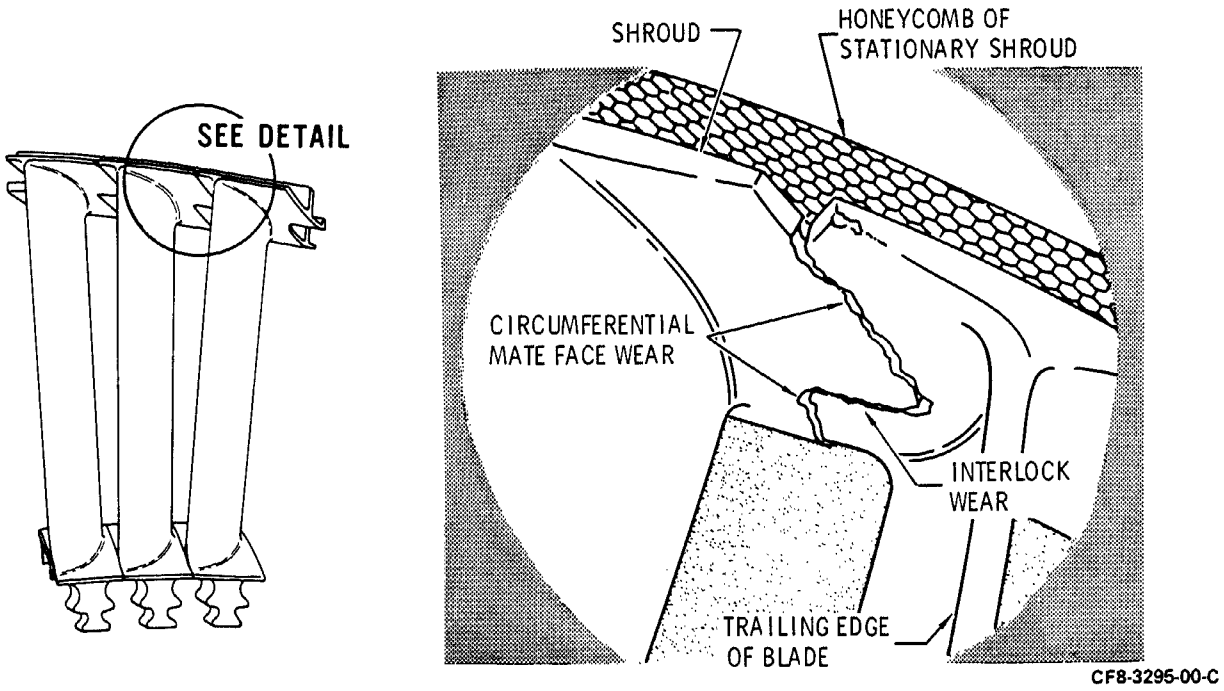


TYPICAL AIRFOIL CONTOURS

CF8-D3132-00-A

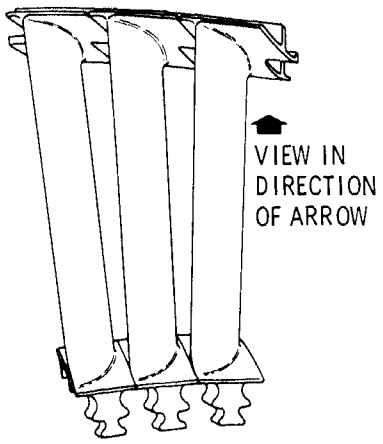
BM5 72 57 00 6 LGMO - 19 - 15
DM5

Typical Stage 1 Airfoil Contours
Figure 602



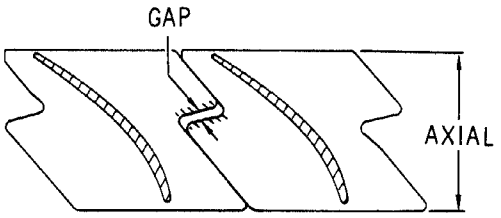
BM5 72 57 00 6 LCMO - 13 - 08
DM5

Shroud Circumferential Mate Face and Interlock Wear (as seen through Borescope)
Figure 603



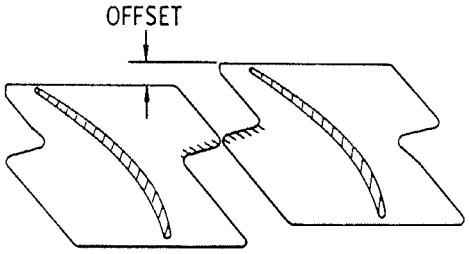
AFT LOOKING FORWARD

NOT SERVICEABLE



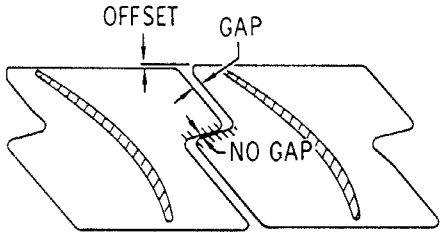
- SMOOTH INTERLOCK WEAR
- LOSS OF AXIAL PRELOAD

NOT SERVICEABLE



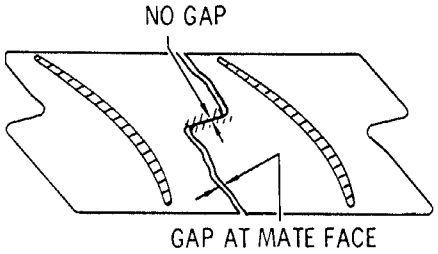
- BLADE FWD/AFT EDGES OFFSET
- SMOOTH INTERLOCK WEAR
- AXIAL PRELOAD PRESENT
- EXCESSIVE CIRCUMFERENTIAL MOVEMENT ALLOWING INTERLOCK DISCONNECT (UNLATCHING)

SERVICEABLE



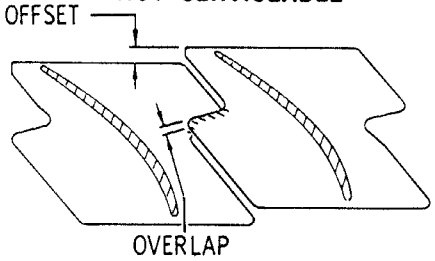
- BLADE FWD/AFT EDGES OFFSET
- SMOOTH INTERLOCK WEAR
- AXIAL PRELOAD PRESENT

SERVICEABLE



- SMOOTH/IRREGULAR WEAR ON CIRCUMFERENTIAL MATE FACE
- AXIAL PRELOAD PRESENT

NOT SERVICEABLE



- BLADE FWD/AFT EDGES OFFSET
- AXIAL PRELOAD PRESENT
- TIP SHROUDS OVERLAPPED (SHINGLING) AT INTERLOCK OR CIRCUMFERENTIAL MATE FACE

CF8-A6004-00-A

BM5 72 57 00 6 LEMO - 17 - 12
DM5

Examples of Shroud Circumferential Mate Face and Interlock Wear
Figure 604

TURBINE REAR FRAME ASSEMBLY - INSPECTION/CHECK

1. General

A. Maintenance of the turbine rear frame (TRF) assembly is limited to external areas when the engine is installed on the aircraft.

2. Equipment and Materials

ITEM	DESIGNATION
Referenced Procedures	
- 70-00-00, P. Block 201	Engine Standard Practices
- 71-00-00, P. Block 401	General

3. Visual Inspection/Check

A. Do a visual inspection of the items that follow. Unless other instructions are given, accept all cracks 0.063 in. (1.60 mm) long, or less. They must not cause air and/or fluid leakage. If there are possible cracks, do a fluorescent-penetrant inspection to make sure (Ref. 70-00-00, P. Block 201).

(1)Visually examine the TRF structure for the conditions that follow : (Ref. Fig. 601)

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(a) Cracks in flanges	One crack in a flange hole is permitted. It must be located radially outward from the hole and separated from the next hole crack by at least four boltholes.	If the damage is more than the limit, remove the engine. (Ref. 71-00-00, P. Block 401)
(b) Cracks that are in the aft flange scallop	Permitted, one radial crack per scallop. Limit five scallops with cracks. Two adjacent scallops with cracks permitted if they have three uncracked scallops on each side	If the damage is more than the limit, remove the engine. (Ref. 71-00-00, P. Block 401)
(c) Radial flange cracks that turn forward into axial cracks at the outer panel, 10 o'clock to 2 o'clock (engine mount area)	Permitted, if less than 1.0 inch (25 mm) in length	If the damage is more than the limit, remove the engine. (Ref. 71-00-00, P. Block 401)

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(d) Radial flange cracks that turn forward into axial cracks, 2 o'clock to 10 o'clock (not in the engine mount area)	Permitted, if less than 1.0 in. (25 mm) in length. For cracks 1.0-2.0 in. (25-51 mm) long, do a visual inspection each 100 cycles.	If the damage is more than the limits, replace the engine. (Ref. 71-00-00/401)
(e) Parent metal cracks in outer panels from 10 o'clock to 2 o'clock (engine mount areas)	Permitted if not more than 0.06 in. (1.5 mm) long and at least 0.5 in. (13 mm) distance between the cracks	If the damage is more than the limit, remove the engine. (Ref. 71-00-00, P. Block 401)
(f) Cracks in the outer panels from 2 to 10 o'clock (does not include the engine mount area)	For cracks less than 1.0 in. (25 mm) long, do a visual inspection each time the cowl doors are opened. For cracks 1.0 in. (25 mm) to 3.0 in. (76 mm) long, do a visual inspection every 400 cycles. For cracks 3.0 in. (76 mm) to 6.0 in. (152 mm) long, do a visual inspection every 100 cycles. Cracks longer than 6.0 in. (152 mm) are not serviceable. R You can do the stop drill procedure as follows on cracks less than 6.0 in. (154.2 mm). You must keep the visual inspection requirements. Do an eddy current inspection or a fluorescent penetrant inspection (FPI) - (Ref. 70-00-00, P. Block 201) on the outer diameter and inner diameter of the case skin to find the ends of the cracks. Stop drill the end of the cracks with a 0.116-0.136 in. (2.95-3.45 mm) diameter drill. R NOTE : The hole must fully cover the end of the crack (this procedure increases the length of the crack). R Break the edge of the stop drill hole on the outside of the case	

	INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
R		and on the inside. The break edge should be 0.020 in. (0.51 mm) minimum. Use a cratex wheel (Material No. C10-043) to polish the inner diameter of the stop drill holes and the broken edges until they are smooth and shiny. After stop drilling, do an ECI or FPI - (Ref. 70-00-00, P. Block 201) to make sure that the end of the crack is fully covered. If not, you can do this procedure again.	
	(g) Nicks, gouges, and/or other surface defects in the outer panels	Permitted if the depth is not more than 0.040 in. (1.02 mm). Blend to limits of (1), (b) and (c) above. If the damage is more than the limit, blend and do an inspection for cracks each time the cowl doors are opened. Use the limits from (1), (b) and (c) above	If the damage is more than the limit, remove the engine. (Ref. 71-00-00, P. Block 401)
	(h) Dent in the outer panels	Permitted if the contour is smooth and is not more than 0.25 in. (6.4 mm) in depth. If the dent is more than the limit, do an inspection for cracks each time the cowl doors are opened. Use the limits from (1), (b) and (c) above	If the damage is more than the limit, remove (Ref. 71-00-00, P. Block 401)
	(i) Nicks, gouges, and/or other surface defects in the struts	Permitted if the depth is not more than 0.040 in. (1.02 mm), or 1.0 in. (25 mm) long. Also it must not be less than 1.0 in. (25 mm) from an adjacent defect	If the damage is more than the limit, remove the engine. (Ref. 71-00-00, P. Block 401)
	(j) Dents in the struts	Permitted if the contour is smooth and the depth is not more than 0.25 in. (6.4 mm)	If the damage is more than the limit, remove the engine. (Ref. 71-00-00, P. Block 401)

(2)Visually examine the oil supply and scavenge tubes for the conditions that follow :

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(a) Cracks	Not serviceable	Replace the tube(s)
(b) Nicks and/or scratches	Permitted if the depth is not more than 0.010 in. (0.25 mm), after removal of the high metal	If the damage is more than the limit, replace the tube(s)
(c) Smooth contour dents	Permitted if the contour is smooth and is not more than 0.063 in. (1.60 mm) in depth	If the damage is more than the limit, replace the tube(s)
(d) Damaged threads	One full thread (total length and/or continuous) can be damaged after chasing the threads	If the damage is more than the limit, replace the tube(s)
(e) Oil coke buildup (external)	Permitted	Remove coking

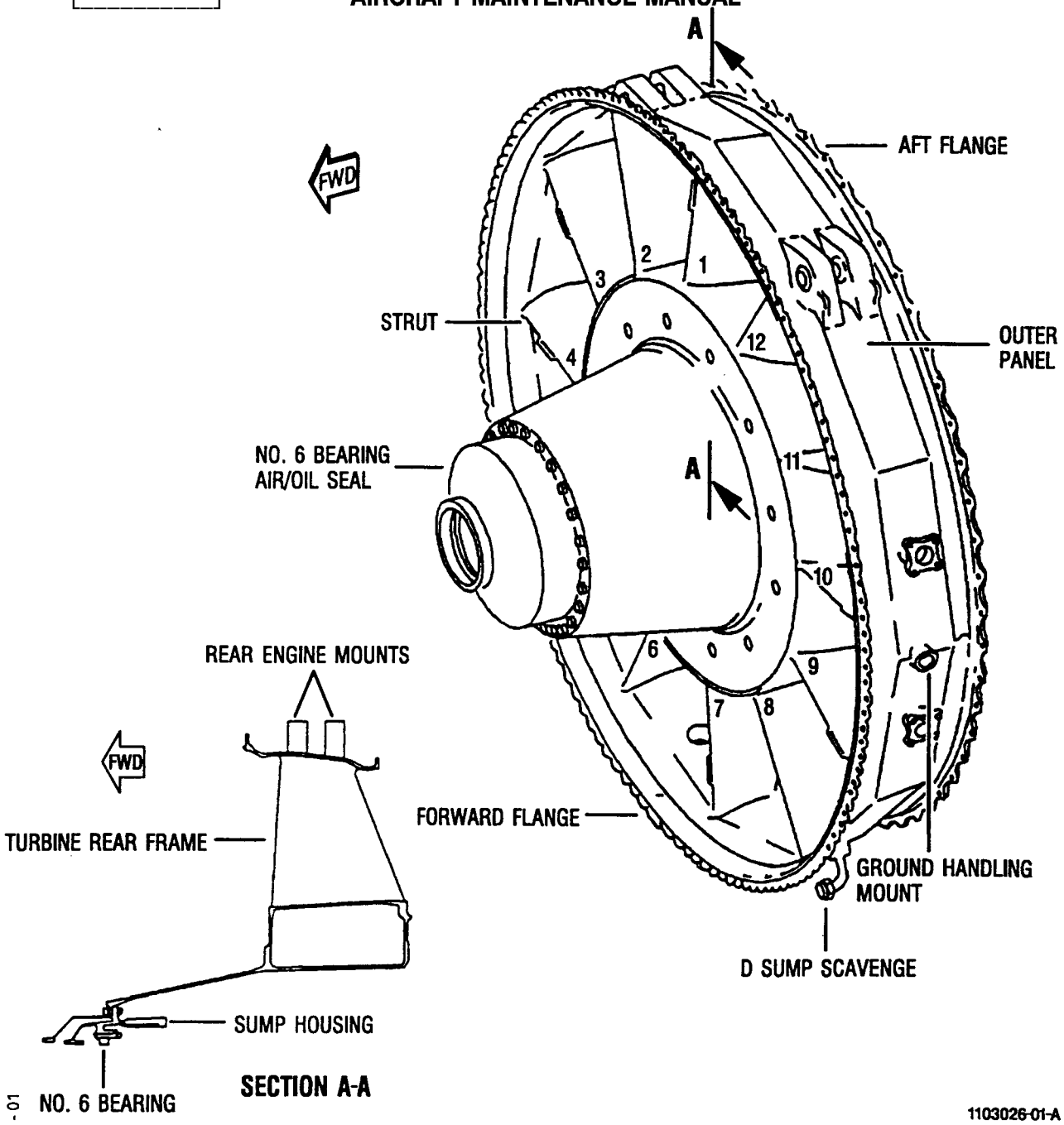
(3)Visually examine the ground handling boss bushings for the conditions that follow : (Ref. Fig. 602)

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(a) Looseness	Permitted if the boss bushing is still in the correct position after the ground handling stand pin is fully inserted	Replace the boss bushing if the pin will not fully go into the boss
(b) Missing	Not serviceable	The boss bushing must be temporarily installed when the engine is removed and the ground handling stand pin fully inserted

B. Visually examine the aft lower engine mount lugs to make sure it is

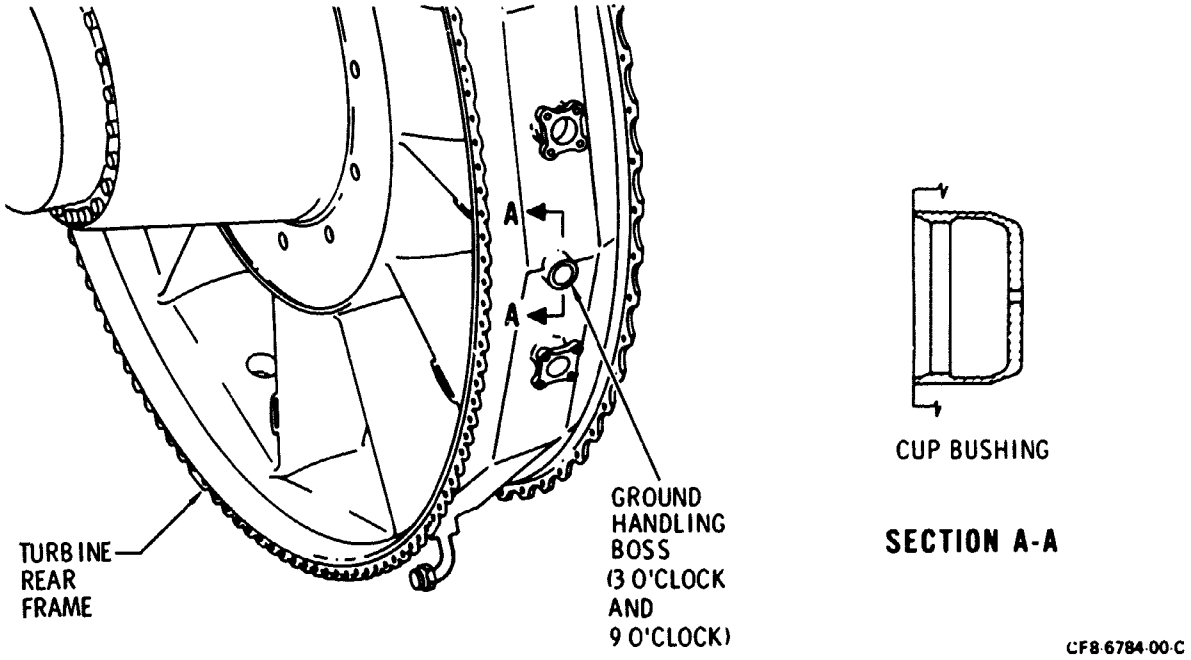
structurally serviceable and for signs of deformation. If there is deformation and/or it is not structurally serviceable, replace the engine (Ref. 71-00-00, P. Block 401).

Printed in France



BM5 72 58 00 6 LAMO - 01

Turbine Rear Frame Inspection
Figure 601



BM5 72 58 00 6 LCMO - 13 - 08
DM5

Ground Handling Boss Bushing Inspection
Figure 602

D-SUMP COVER AND OIL SLINGER SEAL - REMOVAL/INSTALLATION

1. General
   This procedure describes the removal and installation of the D-sump cover and oil slinger seal.

2. Equipment and Materials
   NOTE : Equivalent substitutes may be used instead of the following items :

ITEM	DESIGNATION
A. Material No.C02-033	Antiseize Compounds, Lubricants, Oils (Ref. 70-00-00)
B. Material No.C02-058	Antiseize Compounds, Lubricants, Oils (Ref. 70-00-00)
C.	Circuit Breaker Safety Clips
D.	Access Platform
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 78-11-02, P. Block 401	Turbine Exhaust Plug

3. Procedure

A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open core cowl doors (Ref. 71-13-00, P. Block 301).
(2)Install access platform.

B. Removal (Ref. Fig. 401)
(1)Remove the turbine exhaust plug (Ref. 78-11-02, P. Block 401).
(2)Remove the insulation blanket, sump cover and the oil slinger (Ref. Fig. 401).
WARNING : DO NOT TOUCH THE INSULATION BLANKETS WITHOUT GLOVES OR SPECIAL EQUIPMENT. THE INSULATION BLANKETS CAN CONTAIN CERAMIC FIBERS THAT CAN CAUSE DAMAGE TO YOUR SKIN, EYES AND LUNGS. IF YOU DO NOT USE SKIN, EYES AND LUNG PROTECTION, YOU CAN CAUSE INJURY TO PERSONS.
(a)Remove the eight nuts that attach the insulation blankets and the sump cover to the aft sump housing.
(b)Remove the insulation blanket and the sump cover.
(c)Remove the seven nuts that attach the oil slinger to the stud on the No. 6 bearing spanner nut.
(d)Remove the oil slinger and seal ring.

C. Installation (Ref. Fig. 401)
(1)Visually examine the sump cover and oil slinger for signs of distortion.
(a)Replace these parts if they are damaged.
(2)Visually examine the preformed packing and the sump cover for signs of heat distress.
(a)Replace the preformed packing.

(3)Do the steps that follow to install the insulation blanket, sump cover, oil slinger and seal ring.

(a)Install a new seal ring and the oil slinger to the studs on the No. 6 bearing inner nut.

WARNING : HIGH TEMPERATURE ANTISEIZE IS AN AGENT THAT IS POISONOUS. MAKE SURE ALL PERSONS OBEY THE PRECAUTIONS WHEN HIGH TEMPERATURE ANTISEIZE IS USED. DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES. CLOSE THE CONTAINER WHEN NOT USED. DO NOT GET HIGH TEMPERATURE ANTISEIZE IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES. DO NOT BREATH THE GAS.

WARNING : REFER TO THE MANUFACTURER'S OR SUPPLIER'S MSDS FOR ; MORE PRECAUTIONARY DATA, APPROVED SAFETY EQUIPMENT AND EMERGENCY MEDICAL AID. TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

(b)Apply Material No.C02-058 to the threads and washer faces of the seven nuts.

(c)Connect the oil slinger to the spanner nut with the seven nuts.

1 TORQUE the nuts to between 33 and 37 lbf. in. (0.37 and 0.42 m.daN).
- Clean off all unwanted lubricant.

WARNING : WHITE PETROLATUM IS AN AGENT THAT IS AN IRRITANT. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN WHITE PETROLATUM IS USED. DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES. USE IN AN OPEN AREA. CLOSE THE CONTAINER WHEN NOT USED. DO NOT BREATH THE MIST.

WARNING : REFER TO THE MANUFACTURER'S OR SUPPLIER'S MSDS FOR ; MORE PRECAUTIONARY DATA, APPROVED SAFETY EQUIPMENT AND EMERGENCY MEDICAL AID. TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

(d)Apply Material No.C02-033 to a new preformed packing.

(e)Apply Material No.C02-033 to the mating surfaces of the sump cover and sump housing.

1 Install the preformed packing in the groove of the sump cover.

WARNING : HIGH TEMPERATURE ANTISEIZE IS AN AGENT THAT IS POISONOUS. MAKE SURE ALL PERSONS OBEY THE PRECAUTIONS WHEN HIGH TEMPERATURE ANTISEIZE IS USED. DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES. CLOSE THE CONTAINER WHEN NOT USED. DO NOT GET HIGH TEMPERATURE ANTISEIZE IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES. DO NOT BREATH THE GAS.

WARNING : REFER TO THE MANUFACTURER'S OR SUPPLIER'S MSDS FOR ; MORE PRECAUTIONARY DATA, APPROVED SAFETY EQUIPMENT AND EMERGENCY MEDICAL AID. TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

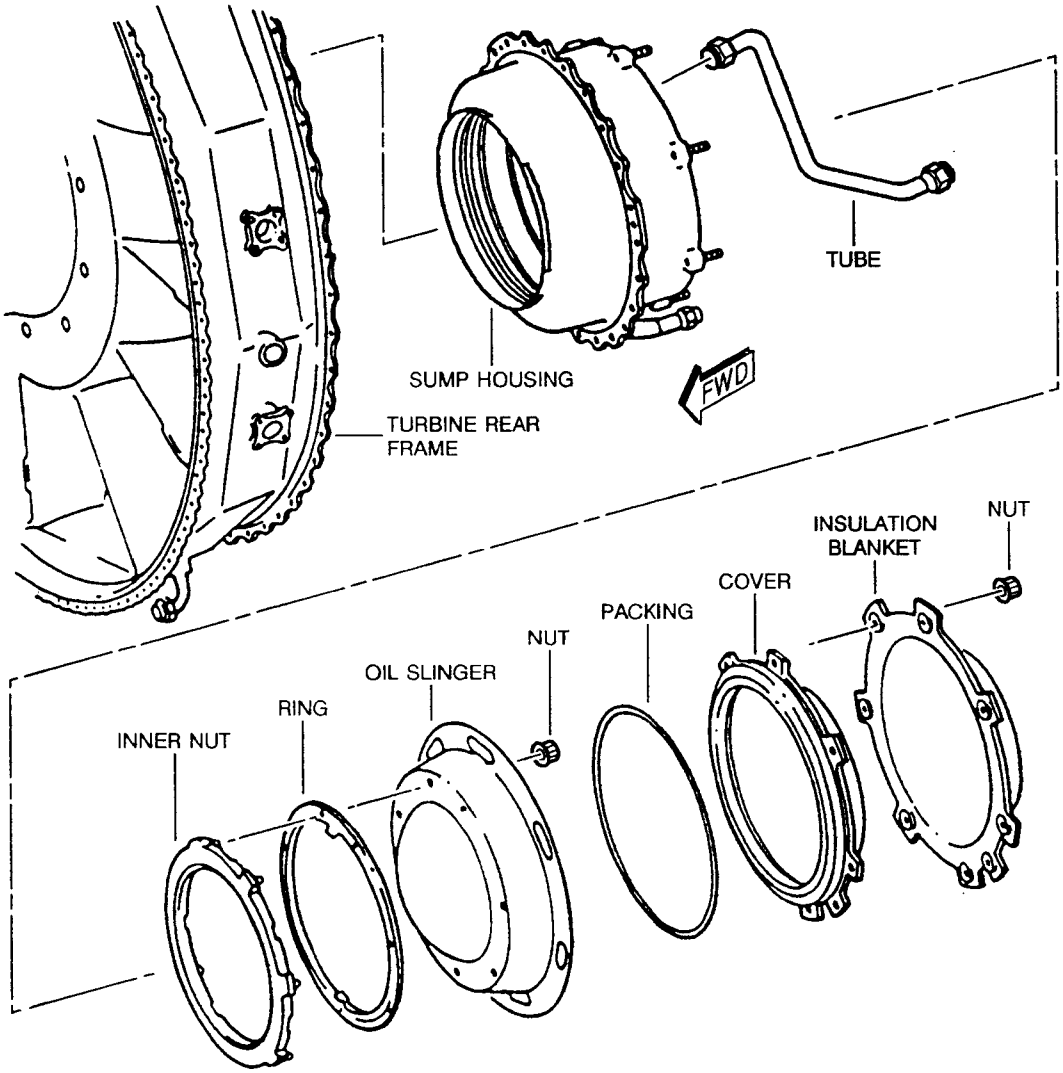
(f)Apply Material No.C02-058 to the sump housing stud threads.

WARNING : DO NOT TOUCH THE INSULATION BLANKETS WITHOUT GLOVES OR SPECIAL EQUIPMENT. THE INSULATION BLANKETS CAN CONTAIN CERAMIC FIBERS THAT CAN CAUSE DAMAGE TO YOUR SKIN, EYES AND LUNGS. IF YOU DO NOT USE SKIN, EYES AND LUNG PROTECTION, YOU CAN CAUSE INJURY TO PERSONS.

(g)Install the sump cover and insulation blanket to the studs of the sump housing.

(h)Attach the sump cover and insulation blanket to the sump housing with the eight nuts.
1 TORQUE the nuts to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN).
(4)Install the turbine exhaust plug (Ref. 78-11-02, P. Block 401).

D. Close-Up
(1)Make certain that the working area is clean and clear of tools and miscellaneous items of equipment.
(2)Remove access platform.
(3)Close the cowl doors (Ref. 71-13-00, P. Block 301). Remove safety clips and tags and close the circuit breakers.



BM5 72 58 02 4 LAM0 01

D-Sump Cover and Oil Slinger Seal Replacement
Figure 401

OIL SUPPLY TUBE AND OIL SCAVENGE TUBE - REMOVAL/INSTALLATION

1. General

A. This procedure gives instructions to remove and install the tubes located in the turbine rear frame hub and strut areas.
NOTE : Do this procedure only if SB GE 72-664 "Turbine Rear Frame - New Oil Supply and Scavenge Tubes", has been completed.

2. Equipment and Materials

ITEM	DESIGNATION
A. Material No. C10-071	Miscellaneous (Ref. 70-00-00)
B. Material No. C10-143	Miscellaneous (Ref. 70-00-00)
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 78-11-02, P. Block 401	Engine Exhaust Plug
- 78-11-01, P. Block 401	Primary Nozzle Assembly

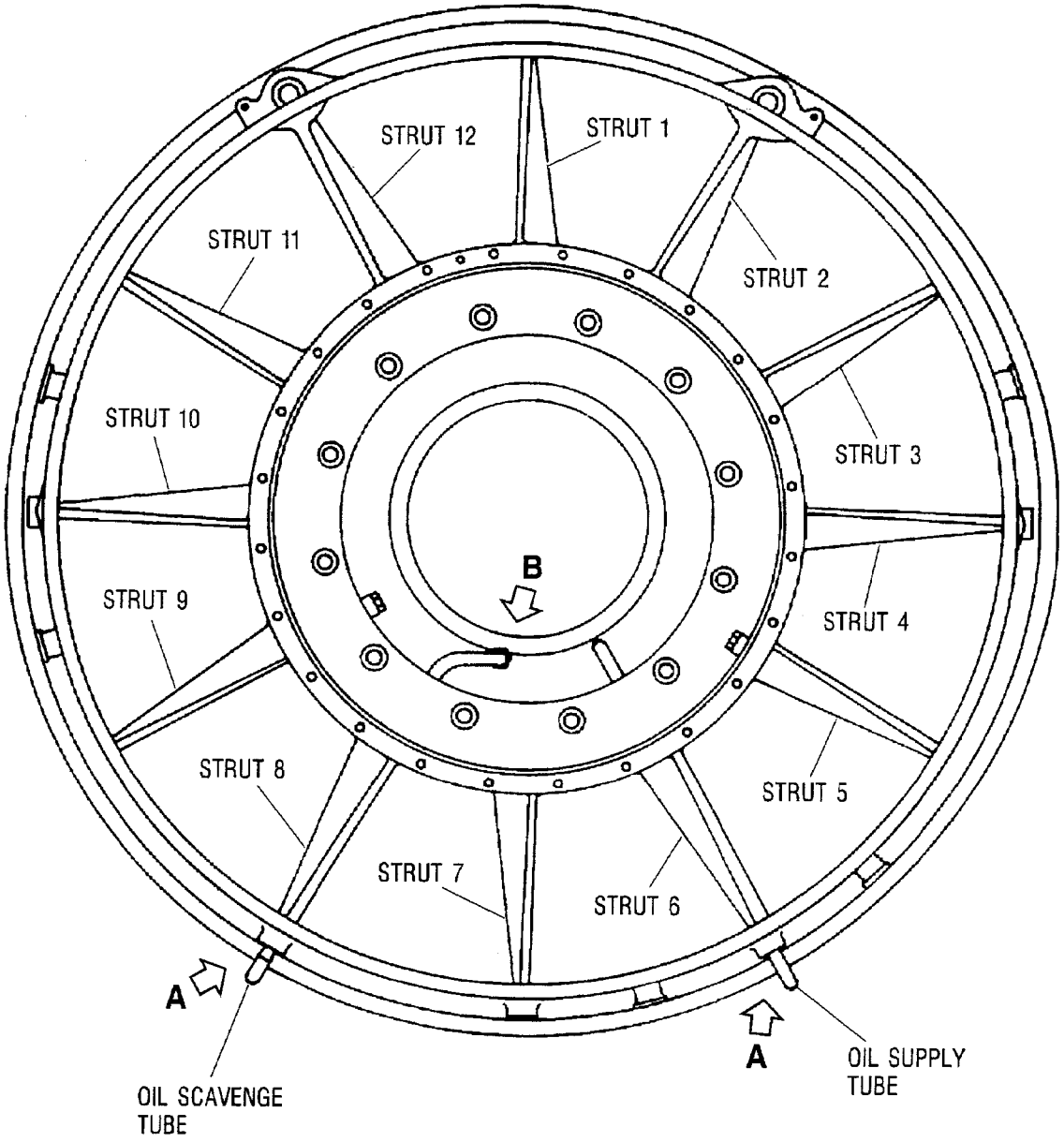
3. Removal Procedure (Ref. Fig. 401)

A. Open, safety and tag the applicable circuit breakers and open the fan cowl, fan reverser, and core cowl doors (Ref. 71-13-00, P. Block 301).

B. Remove the engine exhaust plug (Ref. 78-11-02, P. Block 401).

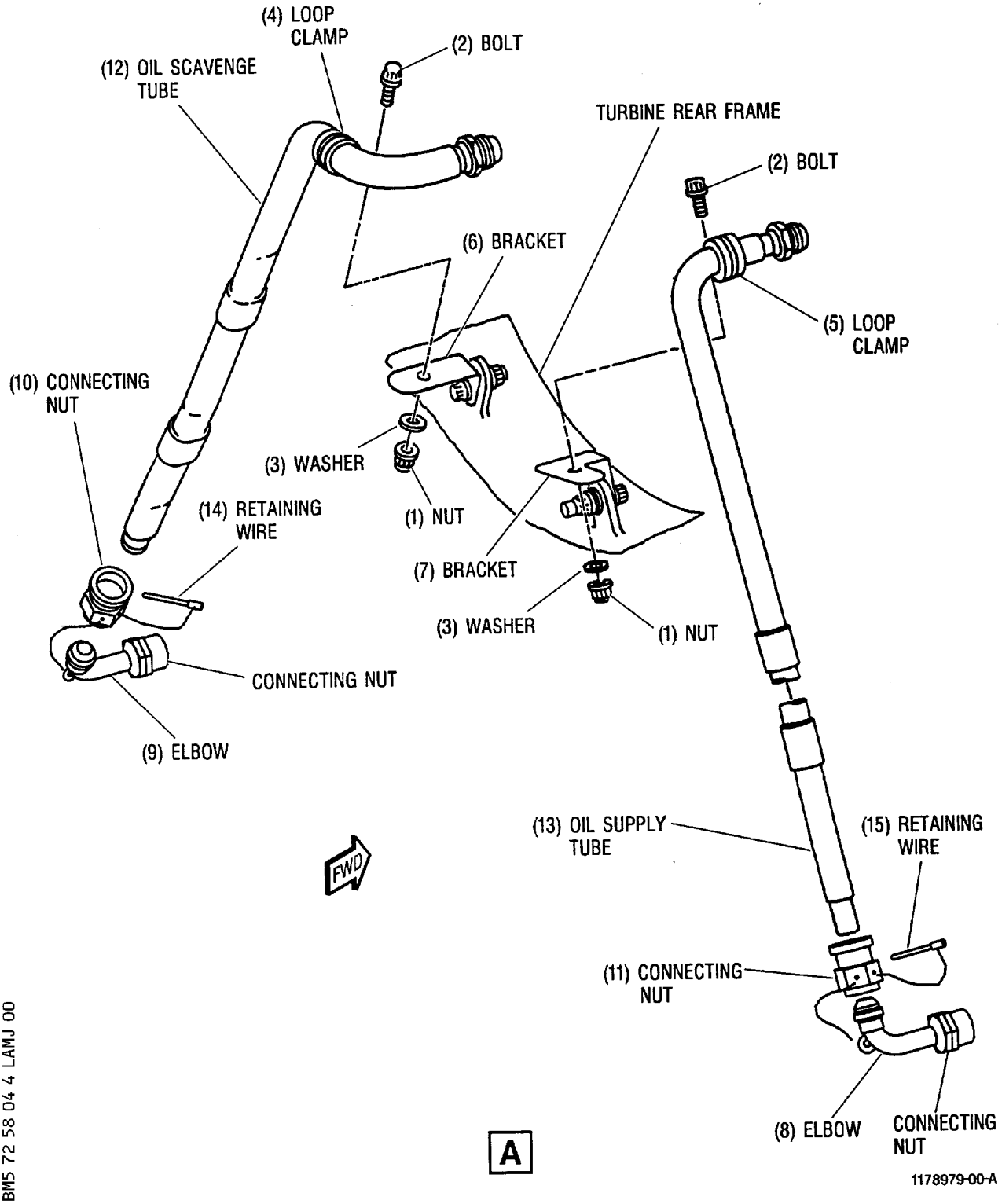
C. Remove the primary nozzle assembly (Ref. 78-11-01, P. Block 401) if necessary.

D. Remove the oil supply and oil scavenge tubes from the turbine rear frame struts as follows :
(1)Remove nuts (1), bolts (2), washers (3), and loop clamps (4) and (5).
(2)Cut the safety cable (C10-143) from the tabs on the elbows (8) and (9).
(3)Pull the safety cable from the safety cable holes in the connecting nuts (10) and (11).
(4)Loosen the connecting nuts (10) and (11) on the outer ends of the oil scavenge tube (12) and the oil supply tube (13). Loosen the elbow tubes (8) and (9) connecting nuts. Remove the elbow tubes (8) and (9).
(5)Remove and discard the retaining wire (14) and (15) from the connecting nuts (10) and (11).
(6)In the hub area of the turbine rear frame, remove the oil scavenge tube (12) and oil supply tube (13) as follows :
(a)Remove nuts (16), bolts (17), and heat shields (18) from oil scavenge tube (12).
(b)Remove nuts (19), bolts (20), and heat shields (21) from oil supply tube (13).
(c)Loosen connecting nuts (22) and (23) on oil scavenge tube (12) and oil supply tube (13).
(7)Remove the oil supply tube (13) and the oil scavenge tube (12) from the turbine rear frame.



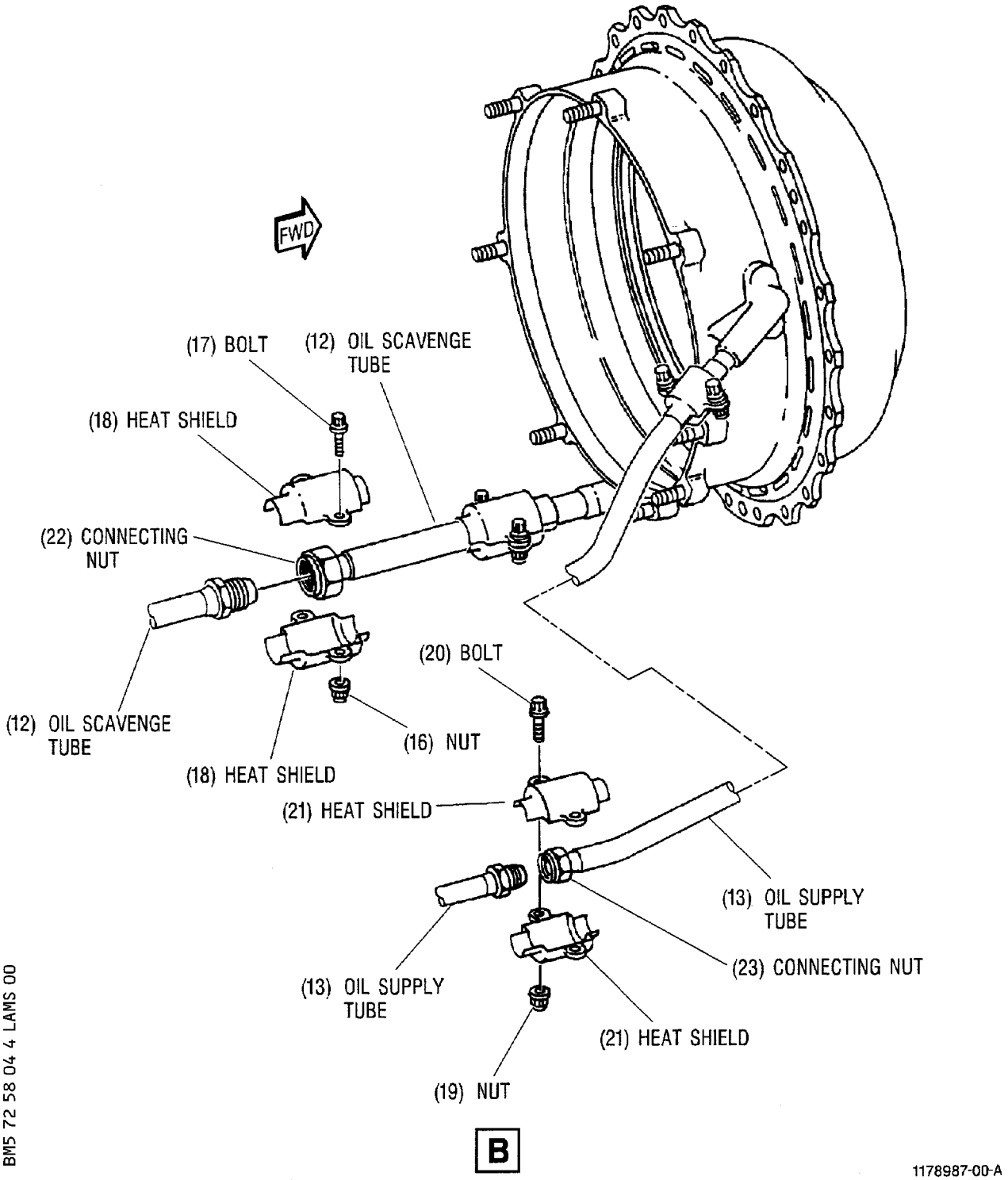
BM5 72 58 04 4 LAMA 00

Turbine Rear Frame Assembly - Oil Supply and Scavenge Tubes (Sheet 1/3)
Figure 401



BM5 72 58 04 4 LAMJ 00

Turbine Rear Frame Assembly - Oil Supply and Scavenge Tubes (Sheet 2/3)
Figure 401



Turbine Rear Frame Assembly - Oil Supply and Scavenge Tubes (Sheet 3/3)
Figure 401

4. Installation Procedure (Ref. Fig. 401)

A. Install the oil supply tube and oil scavenge tube in the turbine rear frame struts as follows :

(1) Install the oil supply tube (13) into strut number 6 from the inner diameter of the turbine rear frame hub.

(2) Attach the loop clamp (5) to the oil supply tube (13).

(3) Use bolt (2), washer (3) and nut (1) to attach the loop clamp (5) to the bracket (7). Tighten with your hand.

(4) Install the oil scavenge tube (12) into strut number 8 from the inner diameter of the turbine rear frame hub.

(5) Attach the loop clamp (4) to the oil scavenge tube (12).

(6) Use one bolt (2), washer (3), and nut (1) to attach the loop clamp (4) to the bracket (6). Tighten with your hand.

(7) In the hub area of the turbine rear frame, connect the oil supply tube (13) to the mating tube. Connect the oil scavenge tube (12) to the mating tube.
Tighten connecting nuts (22) and (23) with your hand.

(8) Install the wire swivel connecting nut (11) to the outer end of the oil supply tube (13).

(9) Install the removable nut retaining wire (15) through the feed hole into the groove in the connecting nut (11).

(10) Connect the elbow (8) to the mating external tube. Tighten the coupling nut with your hand.

(11) Make sure the elbow (8) and the connecting nut (11) are aligned.

(12) TORQUE the oil supply tube connecting nut (11) to between 450 and 550 lbf.in. (5.09 and 6.22 m.daN). TORQUE the elbow (8) connecting nut to between 450 and 550 lbf.in. (5.09 and 6.22 m.daN).
NOTE : When you tighten the connecting nut (11), be careful not to damage the end of the retaining wire.

(13) Attach the safety cable (C10-143) to the tab on the elbow (8) and to the connecting nut (11).

(14) Attach the safety cable (C10-143) from the connecting nut (11) to the retaining wire (15).

(15) Install the connecting nut (10) to the outer end of the oil scavenge tube (12).

(16) Install the retaining wire (14) through the feed hole into the groove in the connecting nut (10).

(17) Connect the elbow (9) to the mating external tube. Tighten the connecting nut with your hand.

(18) Make sure the elbow (9) and the connecting nut (10) are aligned.

(19) TORQUE the oil scavenge tube connecting nut (10) to between 650 and 770 lbf.in. (7.35 and 8.70 m.daN). TORQUE the elbow (9) connecting nut to between 650 and 770 lbf.in. (7.35 and 8.70 m.daN).
NOTE : When you tighten the connecting nut (10), be careful not to damage the end of the retaining wire.

(20) Attach the safety cable (C10-143) to the tab on the elbow (9) and to the connecting nut (10).

(21) Attach the safety cable (C10-143) from the connecting nut (10) to the retaining wire (14).

(22) In the hub area of the turbine rear frame, TORQUE the oil supply tube

connecting nut (23) to between 450 and 550 lbf.in. (5.09 and 6.22 m.daN).

(23) In the hub area of the turbine rear frame, TORQUE the oil scavenge tube connecting nut (22) to between 650 and 770 lbf.in. (7.35 and 8.70 m.daN).

(24) In the hub area of the turbine rear frame install heat shields (18) and (21) as follows :

(a) Install heat shields (18) on oil scavenge tube (12) and attach with nuts (16) and bolts (17).

(b) Install heat shields (21) on oil supply tube (13) and attach with nuts (19) and bolts (20).

(c) TORQUE nuts (16) and (19) to between 33 and 37 lbf.in. (0.37 and 0.42 m.daN).

(25) TORQUE loop clamp nuts (1) to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN).

B. Install the primary exhaust nozzle, if necessary (Ref. 78-11-01, P. Block 401).

C. Install the engine exhaust plug (Ref. 78-11-02, P. Block 401).

D. Close fan cowl, fan reverser, and core cowl doors. Remove safety clips and tags and close the applicable circuit breakers (Ref. 71-13-00, P. Block 301).

NOZZLE - OIL SUPPLY - REMOVAL/INSTALLATION

1. General

A. This procedure gives instructions to remove and install the oil supply nozzle located inside the D-Sump of the turbine rear frame.

2. Equipment and Materials

ITEM	DESIGNATION
A. Material No.C02-001	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
B. Material No.C02-019	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
C. Material No.C02-033	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
D. Material No.C02-058	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 72-58-02, P. Block 401	D-Sump Cover and Oil Slinger Seal
- 72-58-03, P. Block 401	Center Vent Tube Extension and No. 6 Bearing Oil Slinger
- 78-11-01, P. Block 401	Primary Nozzle Assembly
- 78-11-02, P. Block 401	Engine Exhaust Plug

3. Removal Procedure (Ref. Fig. 401, 402)

A. Open, safety and tag the applicable circuit breakers and open the fan cowl, fan reverser, and core cowl doors (Ref. 71-13-00, P. Block 301).

B. Remove the engine exhaust plug (Ref. 78-11-02, P. Block 401).

C. Remove the primary nozzle assembly, if necessary (Ref. 78-11-01, P. Block 401).

Post SB GE 72-0628

D. Remove the center vent tube extension and No. 6 bearing oil slinger to get access to the oil supply nozzle (Ref. 72-58-03, P. Block 401).

End Post SB GE 72-0628

Post SB GE 72-0648 or SB GE 72-1001

E. Remove the D-sump cover, oil slinger, and seal ring to get access to the oil supply nozzle (Ref. 72-58-02, P. Block 401).

End Post SB GE 72-0648 or SB GE 72-1001

F. Remove lockwire from the bolts that hold the oil supply nozzle and remove the two bolts.

(1)Remove the nozzle and discard the preformed packing.

4. Installation Procedure (Ref. Fig. 401, 402)

A. Lightly coat new preformed packing with Material No.C02-019.

B. Install preformed packing into ring groove of oil supply nozzle.

C. Insert oil supply nozzle in sump housing at approximately 2 o'clock position, with two lube orifices pointing towards the No. 6 bearing and one towards the cover.

D. Coat the threads and washer face of bolts with Material No.C02-001 or Material No.C02-058.

E. Attach the oil supply nozzle to the sump housing with the two bolts and TORQUE bolts to between 55 and 70 lbf.in. (0.6 and 0.8 m.daN).

F. Wipe of excess anti-seize compound.

G. Double lockwire bolts with wire around the aft side of the oil supply nozzle, so that the lube orifice holes are not blocked.

H. Check impingement of jet on No. 6 bearing.
(1)Apply Material No.C02-033 on the No. 6 bearing aft inner edge, opposite the oil supply nozzle.
(2)Disconnect oil supply line external to the turbine rear frame (TRF).
CAUTION : IF ANY CARBON INSIDE THE LINE IS DISLODGED WHEN THE LINE IS DISCONNECTED, IT MUST BE REMOVED.
(3)Connect source of dry, filtered air or nitrogen to pressurize TRF supply line.
(4)Monitor impingement of air at junction of bearing rollers and inner race.
(a)Check for leakage at any internal TRF supply line fittings which have been reassembled.
(5)Remove external air source and reassemble external fittings.
(a)TORQUE the fittings to between 22.1 and 25.4 lbf.ft. (3.0 and 3.4 m.daN).

Post SB GE 72-0628

I. Install the center vent tube extension and No. 6 bearing oil slinger (Ref. 72-58-03, P. Block 401).

End Post SB GE 72-0628
Post SB GE 72-0648 or SB GE 72-1001

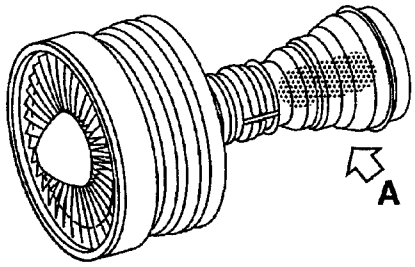
J. Install the seal ring, oil slinger, and D-sump cover (Ref. 72-58-02, P. Block 401).

End Post SB GE 72-0648 or SB GE 72-1001

K. Install the primary exhaust nozzle, if necessary (Ref. 78-11-01, P. Block 401).

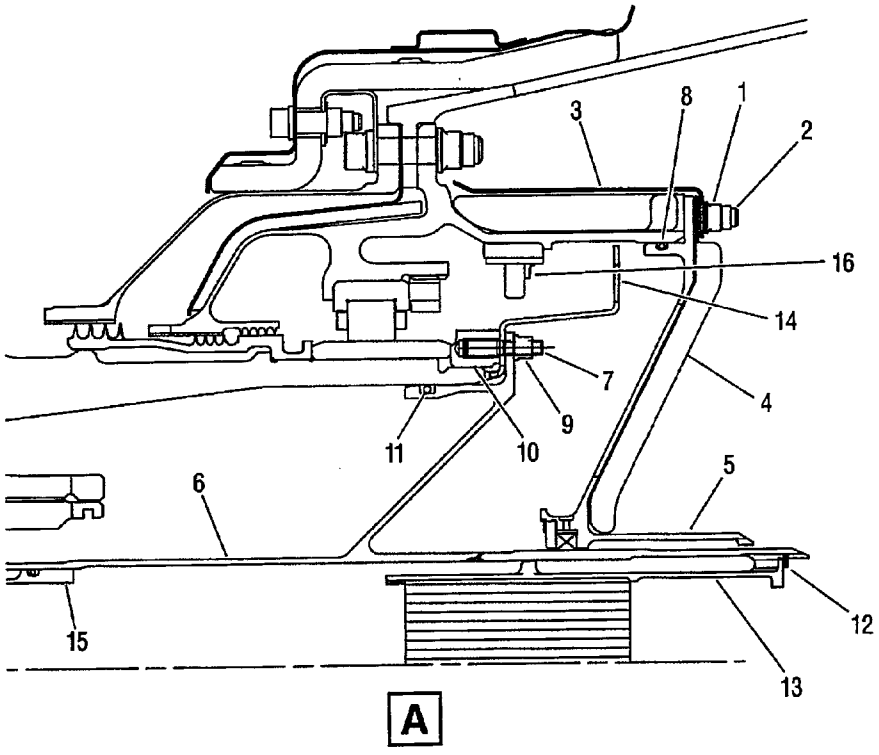
L. Install the engine exhaust plug (Ref. 78-11-02, P. Block 401).

M. Close fan cowl, fan reverser, and core cowl doors. Remove safety clips and tags and close the applicable circuit breakers (Ref. 71-13-00, P. Block 301).



LEGEND:

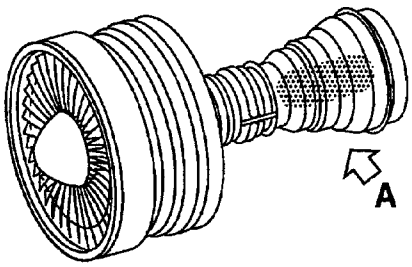
1. NO. 6 BEARING HOUSING NUTS
2. STUD
3. NO. 6 BEARING HEAT SHIELD
4. NO. 6 BEARING THERMAL INSULATION BLANKET
5. NO. 6 BEARING CARBON SEAL HOUSING
6. NO. 6 BEARING CARBON SEAL RUNNER
7. INNER SPANNER NUT STUD
8. RADIAL STATIC OIL SEAL
9. NUT
10. NO. 6 BEARING INNER SPANNER NUT
11. PREFORMED PACKING
12. RETAINING RING
13. FLAME ARRESTOR
14. NO. 6 OIL BEARING SLINGER
15. PREFORMED PACKING
16. OIL NOZZLE



1213853-00-A

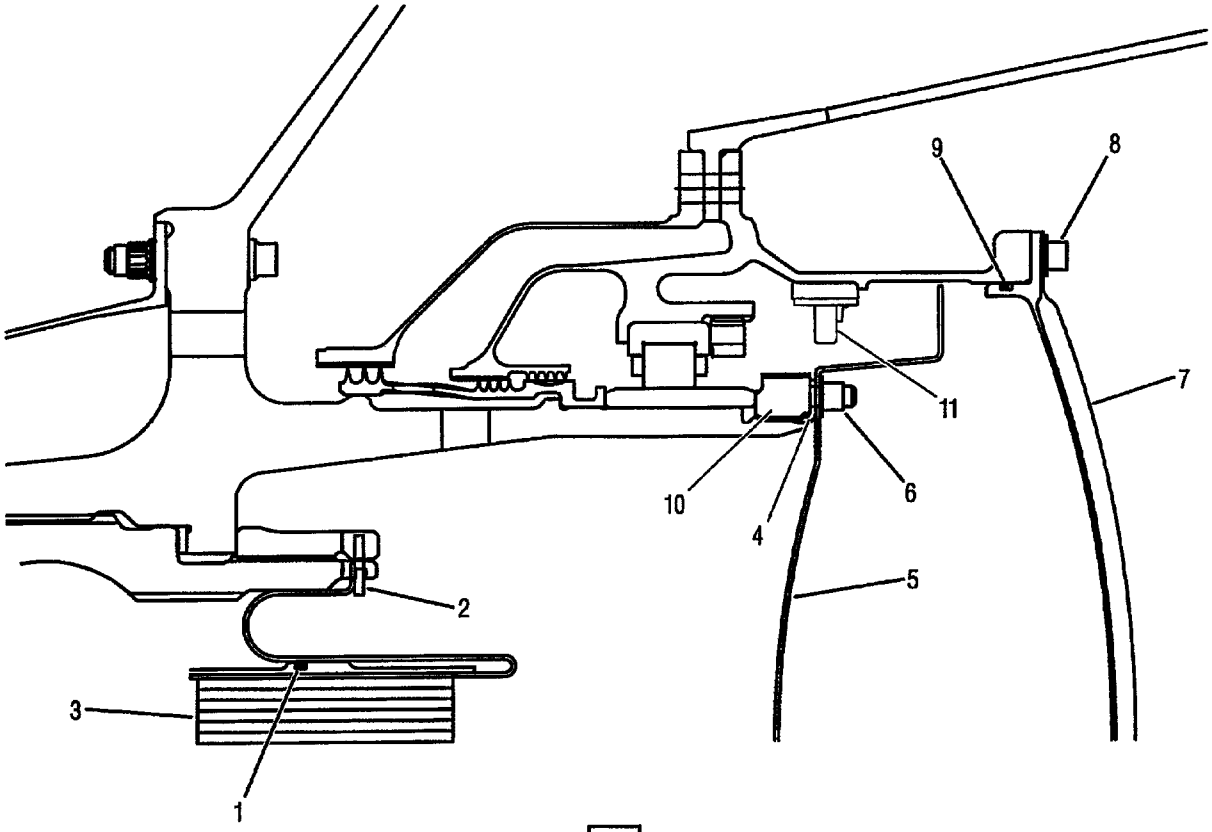
BM5 72 58 05 4 LAMO 00

D-Sump Oil Supply Nozzle Removal/Installation
(Post SB GE 72-0628)
Figure 401



LEGEND:

1. CENTER VENT TUBE PREFORMED PACKING
2. LPT COUPLING NUT RETAINING RING
3. CVT FLAME ARRESTOR
4. NO. 6 BEARING INTERGRAL RING SEAL
5. NO. 6 BEARING OIL SLINGER
6. NO. 6 BEARING INNER SPANNER NUT NUTS
7. NO. 6 BEARING HOUSING COVER
8. NO. 6 BEARING HOUSING NUTS
9. NO. 6 BEARING HOUSING COVER PREFORMED PACKING
10. NO. 6 BEARING INNER SPANNER NUT
11. OIL NOZZLE



BM5 72 58 05 4 LCM0 00

D-Sump Oil Supply Nozzle Removal/Installation
(Post SB GE 72-0648 or SB GE 72-1001)
Figure 402

ACCESSORY DRIVE - DESCRIPTION AND OPERATION

1. General

Torque for both engine and aircraft accessories is obtained from a system of gearboxes and shafts. The accessory gearbox, which is supported by the compressor case, receives torque from the core engine compressor stub shaft. An inclined radial drive shaft transmits this power to the transfer gearbox, mounted below the compressor stator casing. A horizontal drive shaft then transmits the torque to the core mounted accessory drive gearbox. The accessory gearbox drives the following equipments :

- The integrated drive generator (electrical power generation) at 0.8323 N2.
- (2) hydraulic pumps (hydraulic power generation) at 0.344 N2.
- The Main Engine Control and the fuel pump at 0.5837 N2.
- The lube pump at 0.5837 N2.

2. Description

A. Inlet Gearbox Assembly

The inlet gearbox assembly is located in the "A" sump of the engine. The gearbox extracts energy from the core engine rotor and transmits the energy to the canted radial drive shaft located in the 6 O'clock fan frame strut.

B. Radial Drive Shaft

The radial drive shaft transmits torque from the inlet gearbox to the transfer gearbox. It is mounted within a pressure compartment in the fan frame No. 7 strut.

C. Transfer Gearbox Assembly

The transfer gearbox assembly is mounted below the core on the fan frame at the 6 o'clock position. The gearbox transmits torque from the radial drive shaft to the horizontal drive shaft.

D. Horizontal Drive Shaft Assembly

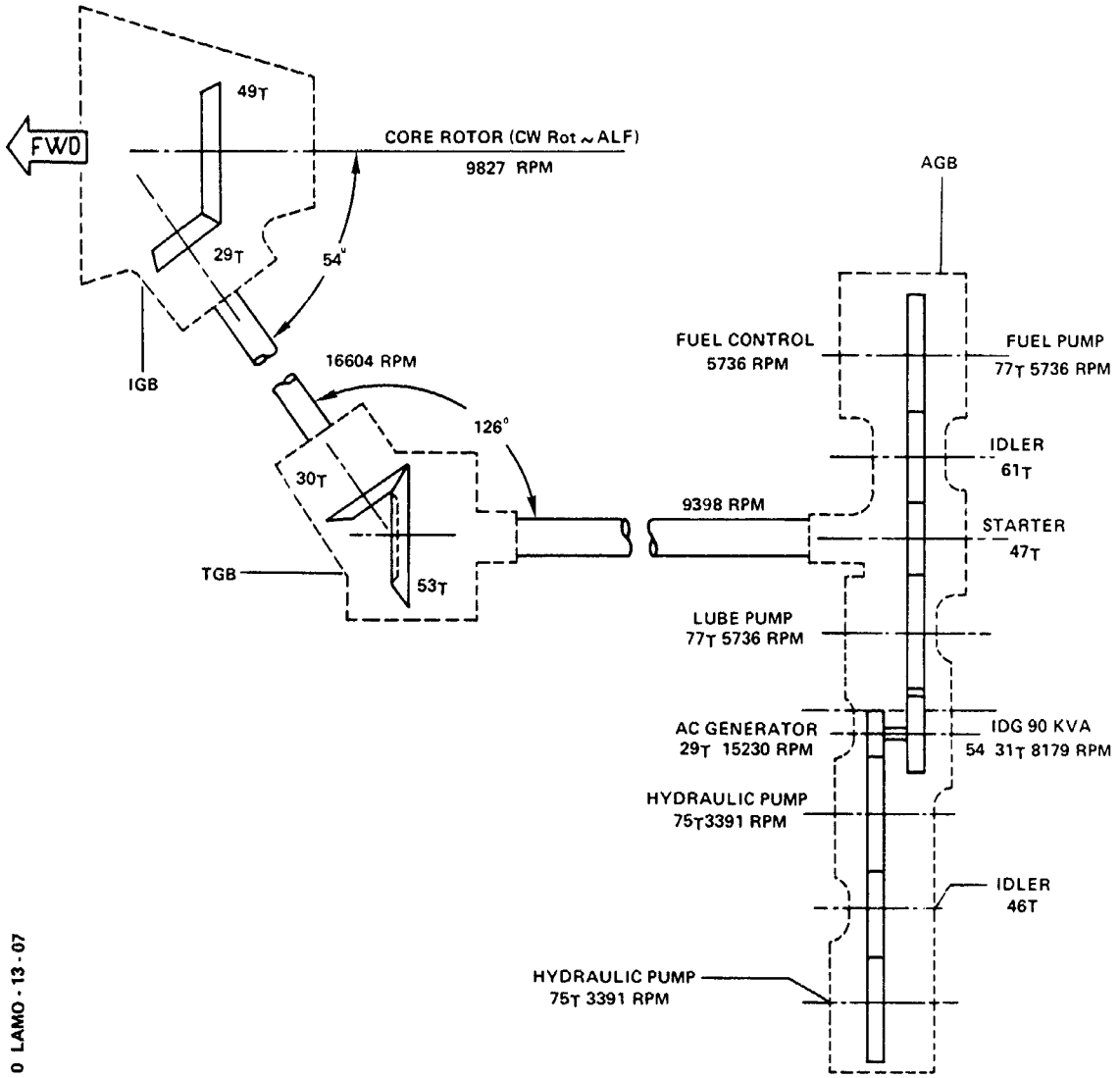
The horizontal drive shaft assembly is mounted between the transfer and accessory gearboxes. The function of the drive shaft is to transmit torque from the transfer gearbox to the accessory gearbox. Components of the assembly will be separated during engine disassembly.

E. Accessory Gearbox Assembly (Ref. Fig. 001)

The accessory gearbox assembly is mounted to the compressor casing. The gearbox receives torque from the horizontal drive shaft and distributes the torque through spur gears to drive the gearbox-mounted accessories.

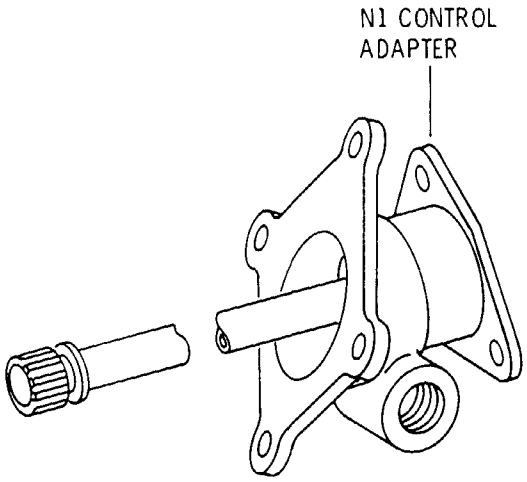
F. N1 Hydromechanical Speed Sensor Adapter (Ref. Fig. 002)

The N1 hydromechanical speed sensor adapter is mounted on the fan frame No. 5 strut and drives the N1 hydromechanical speed sensor.



BM5 72 60 00 0 LAMO-13-07
DM5

Accessory Drives - Schematic
Figure 001



CF8-6727-00-C

BM5 72 60 00 0 LCMO - 13 - 07
DM5

N1 Hydromechanical Speed Sensor Adapter
Figure 002

N1 CONTROL ADAPTER ASSEMBLY - REMOVAL/INSTALLATION

1. General

This procedure provides instructions for removal and installation of N1 Control Adapter Assembly.

2. Equipment and Materials

ITEM	DESIGNATION
A.	Cap
B. Material No.C02-019	Anti-Seize Compounds, Lubricant, Oils (Ref. 70-00-00)
C.	Torque Wrench 55-300 lbf.in. (0.62-3.39 m.daN)
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 73-21-07, P. Block 401	N1 Hydromechanical Speed Sensor
- 71-00-00, P. Block 501	Power Plant - General

3. Procedure

A. Job Set-Up
(1) Open, safety and tag the appropriate circuit breakers and open fan cowl and thrust reverser doors (Ref. 71-13-00, P. Block 301).
(2) Install access platform.

B. Removal (Ref. Fig. 401)
(1) Remove hydromechanical fan speed (N1) sensor from control adapter assembly (Ref. 73-21-07, P. Block 401).
(2) Disconnect oil drain line from control adapter assembly at fan frame strut No. 5. Install protective cap to oil drain line.
(3) Remove nuts and bolts attaching control adapter assembly to fan frame pad.
(4) Carefully remove control adapter from passage-way in strut No. 5 of fan frame.
(5) Remove seal gasket from mounting pad.
(6) Remove nipple and preformed packing from N1 adapter drain port.

C. Installation (Ref. Fig. 401)
(1) Assemble new preformed packing lubricated with engine oil (C02-019) on nipple and install nipple in N1 adapter drain port. TORQUE nipple to between 180 and 200 lbf.in. (2.03 and 2.26 m.daN).
(2) Place seal gasket on control adapter mounting flange.
(3) Install control adapter assembly into the fan frame strut No. 5. Ensure that spline on inner end of shaft engages bevel gear of the inlet gearbox.
(4) Attach control adapter assembly to fan frame with bolts and nuts. TORQUE nuts to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN).
(5) Connect oil drain tube to control adapter assembly and TORQUE tube coupling to between 270 and 300 lbf.in. (3.05 and 3.39 m.daN).

(6)Install hydromechanical fan speed (N1) sensor on control adapter assembly (Ref. 73-21-07, P. Block 401).

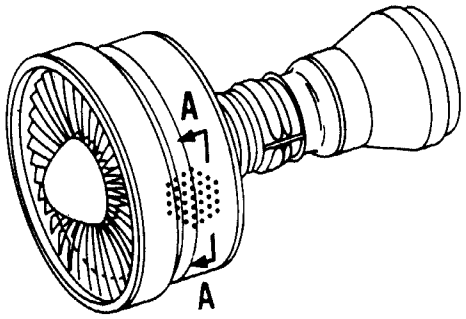
D. Close-Up and Test

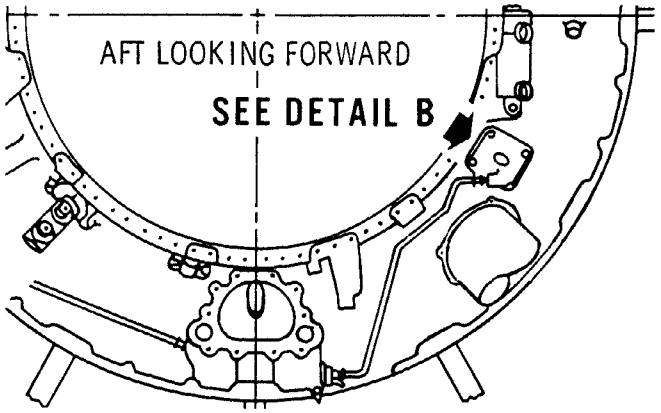
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(2)Remove access platform.

(3)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301). Remove safety clips and tags and close circuit breakers.

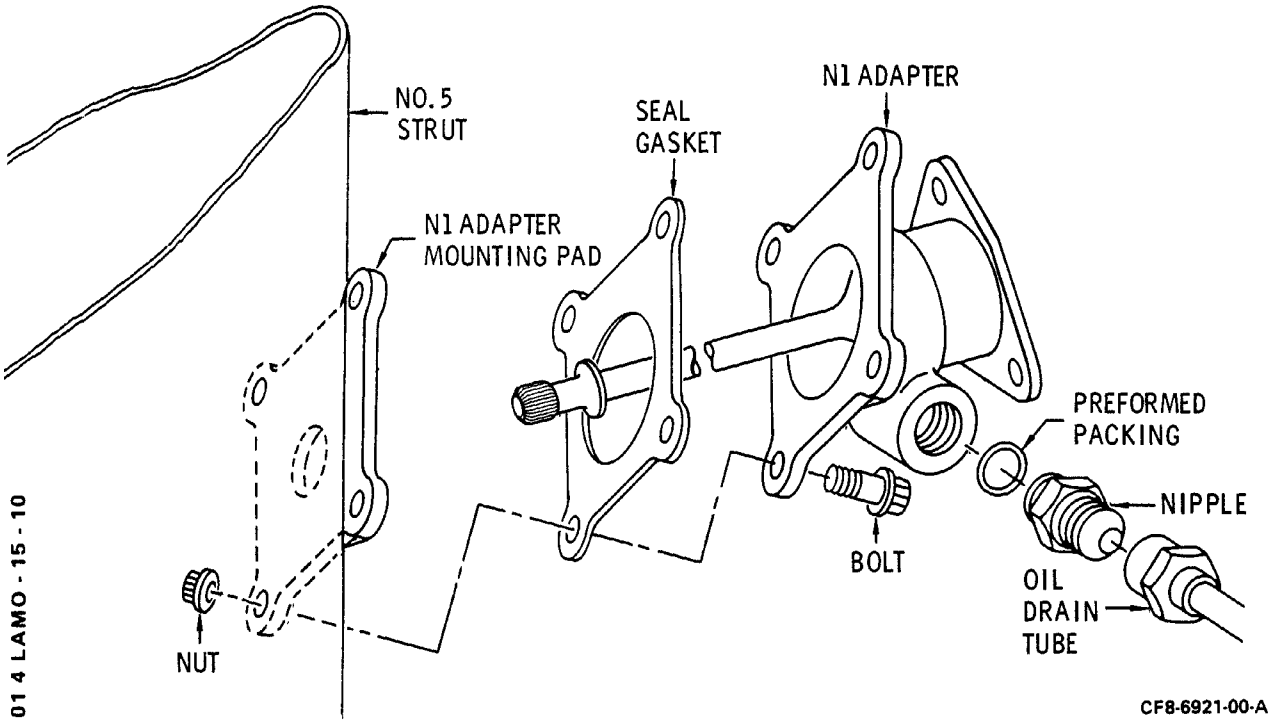
(4)Perform test as indicated in "Type of testing after engine component replacement" (Ref. 71-00-00, P. Block 501).





SECTION A-A

DETAIL B



BM5 72 60 01 4 LAMO - 15 - 10
DM5

N1 Control Adapter Assembly
Figure 401

N1 CONTROL ADAPTER ASSEMBLY - INSPECTION/CHECK

1. General
   This procedure pertains to the inspection and check of the N1 control adapter assembly.

2. Visual Inspection/Check

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(1)Adapter for :		
(a)Cracks	Not serviceable	Replace adapter
(b)Nicks, dents and scratches	Any number, 0.025 in. (0.64 mm) deep	Replace adapter
(2)Drain line fitting for :		
(a)Evidence of leakage	Not serviceable	Tighten fitting or replace packing

N1 CONTROL ADAPTER ASSEMBLY - APPROVED REPAIRS

1. General
This procedure provides repair instructions for the N1 control adapter assembly.

2. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breakers Safety Clips
B. 2C14733	Tool Set, Removal - Magnetic Seal, N1 Control Adapter
C. 2C14776	Tool, Install - Magnetic Seal and Retaining Ring, N1 Control Adapter
D. Material No.C02-007	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
Referenced Procedures	
- 71-13-00, P. Block 301	Cowls Doors
- 73-21-07, P. Block 401	N1 Speed Sensor (Hydro-Mech)

3. Replacement of N1 Control Adapter Magnetic Seal Assembly

A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Remove hydromechanical fan speed (N1) sensor from N1 control adapter assembly (Ref. 73-21-07, P. Block 401).

B. Removal of Magnetic Seal Assembly
(1)Remove retaining ring from inner diameter of adpater (Ref. Fig. 801).
(2)Remove magnet from the N1 adapter as follows :
(Ref. Fig. 802)
(a)Working with the smaller puller of tool set, 2C14733G01, turn knob counterclockwise to retract the fingers inward.
(b)Insert puller through the inner diameter of the magnet until the fingers are just behind the magnet flange.
(c)Turn knob of puller clockwise expanding the fingers and bottoming the plunger against the adapter shaft.
(d)Continue rotating the puller knob to pull the magnet from the adapter.
(e)Release the magnet from the puller by rotating the puller knob counterclockwise.
(f)Remove and discard the preformed packing and place the magnet into a clean plastic bag.
(3)Remove seal case from the N1 adapter as follows :
(a)Working with the larger puller of tool set, 2C14733G01, turn knob of puller counterclockwise to fully retract the plunger.
(b)Slide the outer sleeve back allowing the flexible fingers to expand.
(c)Insert the puller into the adapter bore until the fingers are behind the seal case.
(d)Push the outer sleeve over the fingers until contacting the body of the

tool.

(e)Rotate the puller knob clockwise to bottom the plunger against the shaft thus pulling the seal case from the adapter.

(f)Slide the outer sleeve back to release the seal case.

(g)Remove and discard the preformed packing from seal case and place the seal case into the plastic bag with the magnet.

C. Installation of Magnetic Seal Assembly into N1 Control Adapter With Install Tool 2C14776 (Ref. Fig. 803)

NOTE : Tool 2C14776 provides a method of installing the megnetic seal and retaining ring as an assembly while the N1 control adapter assembly is installed on the engine. Functionally, it consists of a threaded rod for expanding the tool fingers, and a pusher/plunger for firmly holding the magnetic seal/retaining ring assembly in place.

(1)Separate outer case (10), of tool, 2C14776, by holding sleeve (2), and rotating case counterclockwise to align boltheads of (2) with the holes in the flange of (10).

(2)Position face of pusher (4), just outside of the cavity in (10) by turning the pusher knob (9).

(3)Collapse fingers of holder (3), by turning expander knob, (6) counter-clockwise until the expander (5), retracts enough to free the fingers.

(4)Position fingers of the holder (3), forward of pusher (4), by turning holder knob (7).

CAUTION : DO NOT APPLY ASEMBLY FLUID (CO2-007) ON POLISHED FACE OF EITHER MAGNET OR SEAL CASE.

(5)Clean magnet with tissue paper. Coat a new preformed packing with assembly fluid (CO2-007). Install packing into groove of magnet.

(6)Lightly coat preformed packing with assembly fluid (02-007) and install into inner diameter groove of the seal case.

(7)Place retaining ring on face of the pusher (4), while holding pusher face horizontal.

(8)Place magnet, polished surface up, over the retaining ring on face of the pusher (4), fingers extending through bore of the magnet.

(9)Expand fingers of the holder (3), by rotating expander knob (6), clockwise.

(10)Secure magnet against the pusher (4), by rotating holder knob (7), counterclockwise.

(11)Retract assembly into cavity of the case (10), by rotating pusher knob (9), counteclockwise.

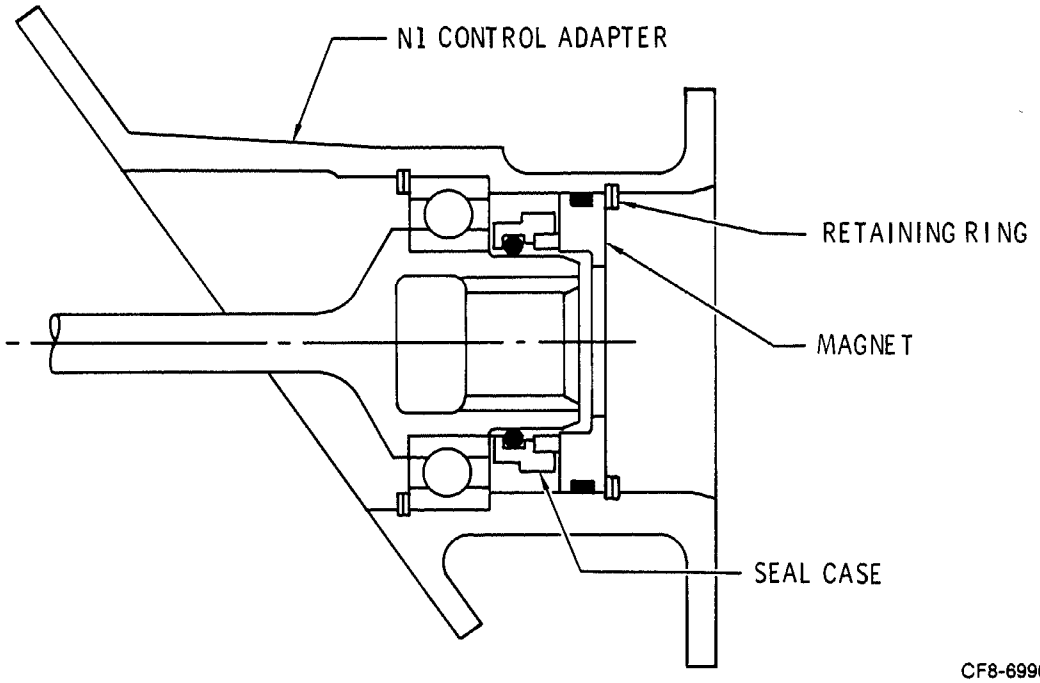
(12)Carefully place the carbon face of seal case against polished surface of magnet. Align the inner diameter of seal case with bore of magnet.

(13)Attach sleeve (2), on face of the N1 control adapter and install bolts and nuts (13) and (14). TORQUE nuts to between 27 and 33 lbf.in. (0.31 and 0.37 m.daN).

(14)Place tool and seal assembly on sleeve (2), by positioning the holes in flange of (10) over bolts on flange of the sleeve (2), and turning (10) clockwise.

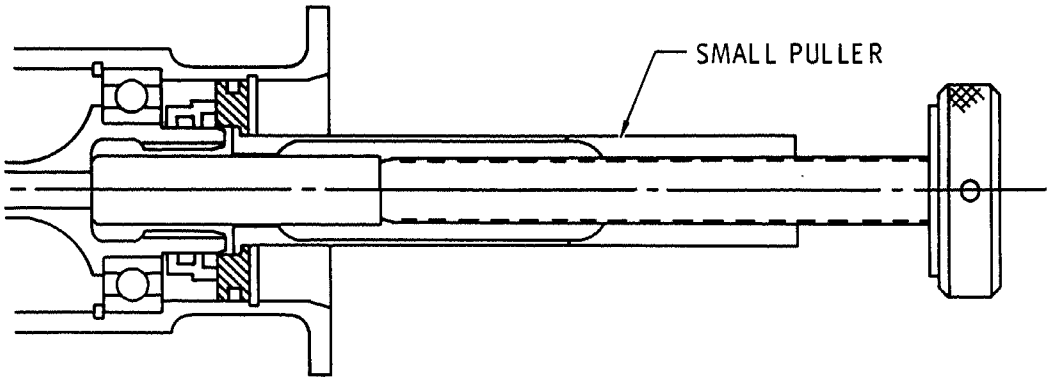
CAUTION : DO NOT TAP OR JAR MAGNETIC SEAL OR DRIVE SHAFT DURING INSTALLATION AS THIS COULD UNSEAT THE SEALING SURFACES. THE MAGNETIC SEAL MUST BE EVENLY PRESSED TO AVOID MISALIGNMENT.

(15)Install magnetic seal assembly by turning pusher knob (9), clockwise

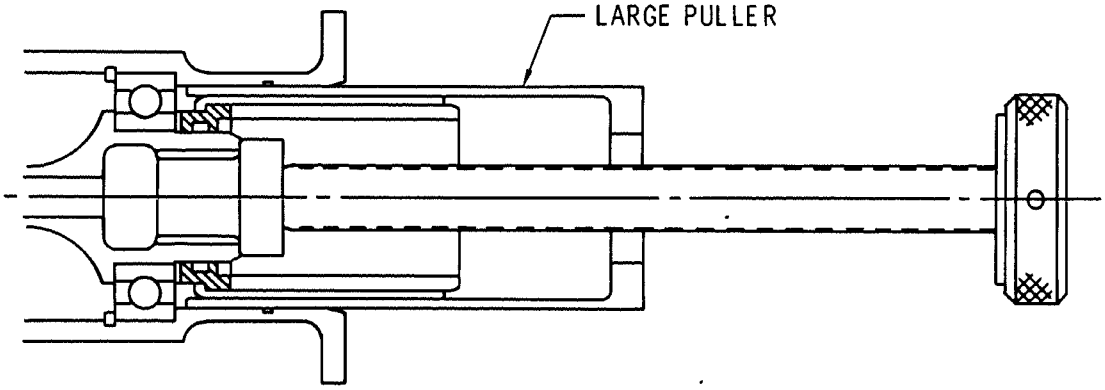


BM5 72 60 01 8 LAMO - 17 - 13
DM5

Magnetic Seal Assembly - Removal/Installation
Figure 801



REMOVAL OF MAGNET



REMOVAL OF SEAL CASE

CF8-6997-00-A

BM5 72 60 01 8 LCMO - 17 - 13
DM5

Magnetic Seal Removal Fixture 2C14733G01
Figure 802

until the white line (relief in (4)) approaches the aft edge of case (10). Then, proceed slowly until retaining ring snaps into groove.

(16)To remove tool, rotate expander knob (6), counterclockwise until it stops.

(17)To remove fingers of the holder (3), rotate holder knob (7), counterclockwise until it stops.

(18)Retract pusher (4), by rotating pusher knob (9), counterclockwise approximately 1.0 in. (25.4 mm).

(19)Remove attachment bolts and nuts (13) and (14), and store tool, 2C14776, in the container.

CAUTION : THE MAGNETIC SEAL ASSEMBLY MUST BE INSTALLED WITH LESS THAN A 0.001 IN. (0.03 MM) GAP BETWEEN THE MAGNET AND RETAINING RING.

(20)Using a 0.001 in. (0.03 mm) feeler gage, check the gap between the retaining ring and magnet. The feeler gage should not be able to be inserted.

D. Installation of Magnetic Seal Assembly into N1 Control Adapter Without Install Tool 2C14776.

NOTE : This is an alternate procedure that may be used to install the magnetic seal assembly into the N1 control adapter. Magnetic seal install tool, 2C14776, is not used.

(1)Install magnetic seal into adapter as follows :

CAUTION : THE MAGNET AND SEAL CASE MUST BE INSTALLED AS AN ASSEMBLY TO ASSURE THE SEALING SURFACES ARE IN CONTACT.

(a)Clean the magnet with tissue paper. Coat a new preformed packing with assembly fluid (C02-007) install packing into groove of magnet.

(b)Coat a second preformed packing with assembly fluid (C02-007) and install in the inner diameter groove of the seal case.

(c)Carefully place the carbon face of seal case against polished surface of magnet. Align the inner diameter of seal case with bore of magnet.

CAUTION : DO NOT TAP OR JAR MAGNETIC SEAL OR DRIVE SHAFT DURING INSTALLATION AS THIS COULD UNSEAT THE SEALING SURFACES. THE MAGNETIC SEAL MUST BE EVENLY PRESSED TO AVOID MISALIGNMENT.

(d)Install magnetic seal assembly over the hub of the shaft and into the bore of adapter.

CAUTION : THE MAGNETIC SEAL ASSEMBLY MUST BE INSTALLED WITH LESS THAN A 0.001 IN. 0.03 MM) GAP BETWEEN THE MAGNET AND RETAINING RING.

(e)Carefully press seal assembly until outer surface of magnet is aligned with inner side of retaining ring groove in the adapter bore.

(2)Install retaining ring into groove in the adapter bore.

(3)Using a 0.001 in. (0.03 mm) feeler gage, check the gap between the retaining ring and magnet. The feeler gage should not be able to be inserted.

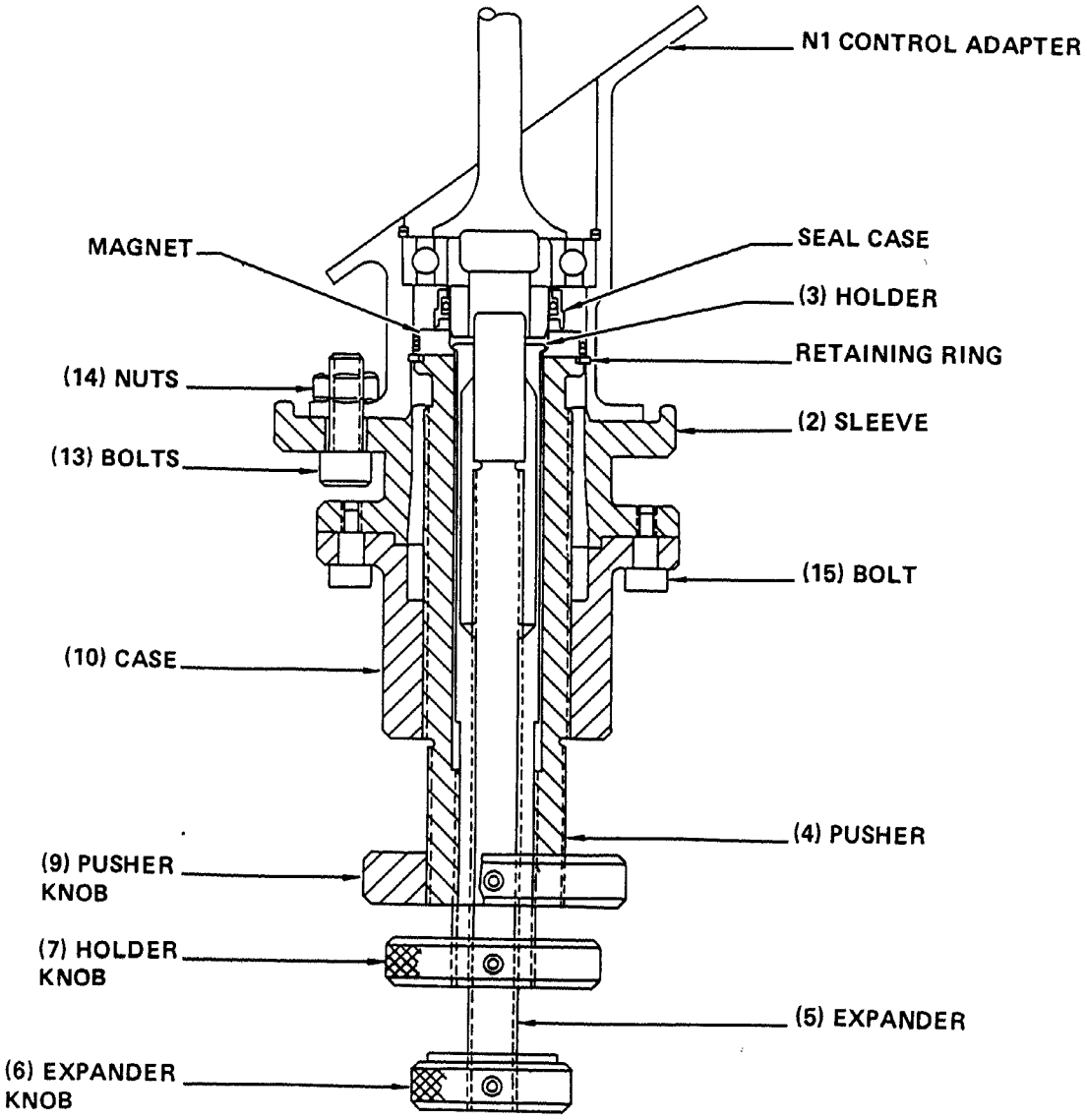
E. Close-Up

(1)Install hydromechanical fan speed (N1) sensor on N1 control adapter assembly (Ref. 73-21-07, P. Block 401).

(2)Make certain that working area is clean and clear of tools and

miscellaneous items of equipment.

(3)Close thrust reverser and fan cowl doors, remove safety clips and tags and close the appropriate circuit breakers (Ref. 71-13-00, P. Block 301).



BM5 72 60 01 8 LEMO - 25 - 20
DM5

Magnetic Seal and Retaining Ring Install Fixture, 2C14776
Figure 803

RADIAL DRIVE SHAFT - REMOVAL/INSTALLATION

1. General

This procedure describes the removal and installation of the radial drive shaft.

NOTE : Removal of the radial drive shaft requires the removal of the transfer gearbox.

2. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breakers Safety Clips
Referenced Procedures	
- 72-63-00, P. Block 401	Transfer Gearbox
- 71-13-00, P. Block 301	Cowl Doors
- 71-00-00, P. Block 501	Power Plant - General

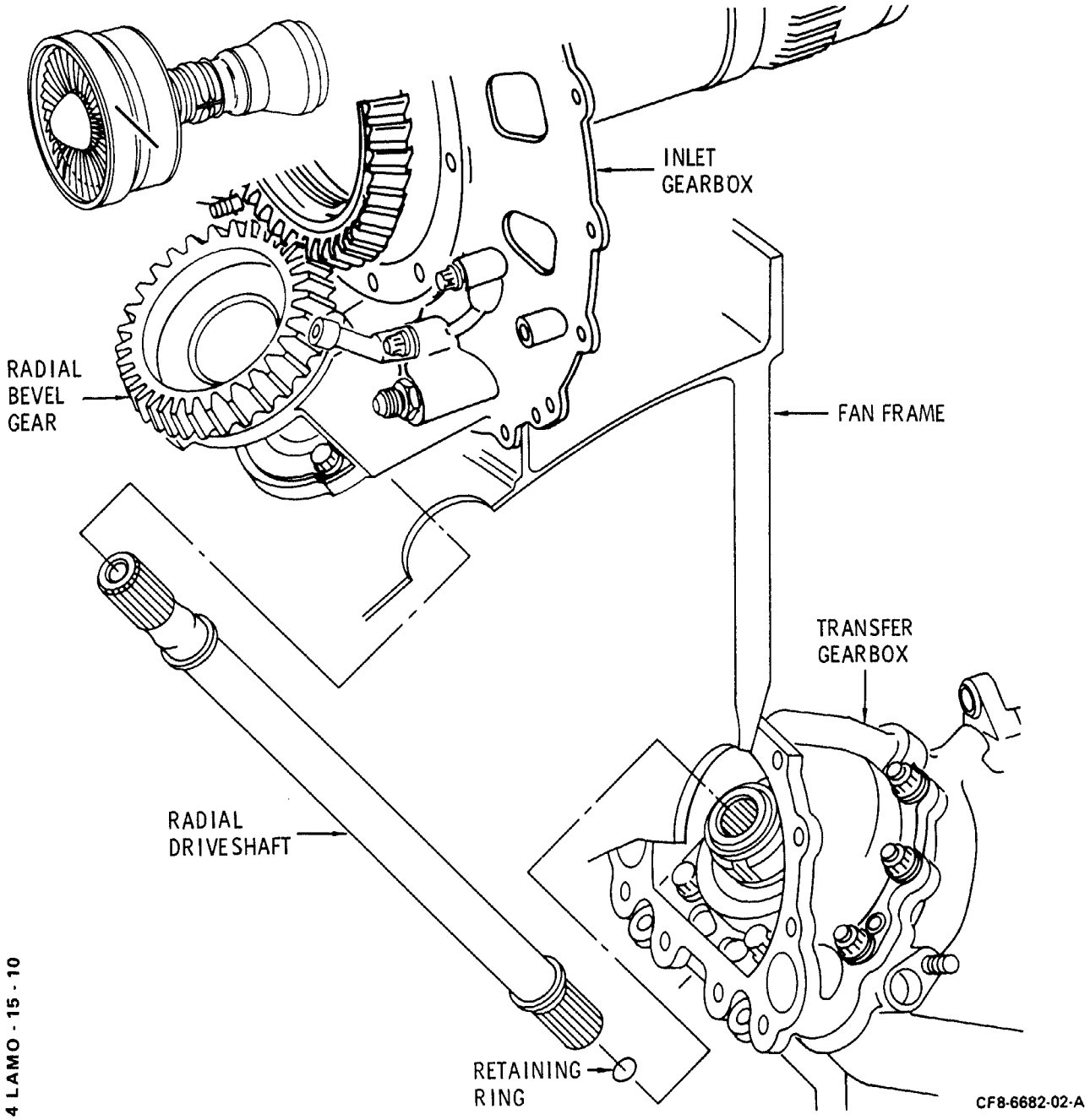
3. Procedure

A. Job Set-Up
(1)Open safety and tag the appropriate circuit breakers and open fan and thrust reverser doors (Ref. 71-13-00, P. Block 301).
(2)Remove transfer gearbox (Ref. 72-63-00, P. Block 401).

B. Removal (Ref. Fig. 401)
(1)Remove radial drive shaft from transfer gearbox.
(2)Remove internal retaining ring from groove at lower end of radial drive shaft inner diameter.

C. Installation (Ref. Fig. 401)
(1)Install retaining ring into groove at lower end of radial drive shaft inner diameter.
(2)Install retaining ring end of radial drive shaft into upper gear spline of transfer gearbox.

D. Close-Up and Test
(1)Install transfer gearbox (Ref. 72-63-00, P. Block 401) and perform test as indicated in "Type of testing after engine component replacement" (Ref. 71-00-00, P. Block 501).
(2)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(3)Close fan cowl doors (Ref. 71-13-00, P. Block 301).
(4)Remove safety clips and tags and close circuit breakers.



BM5 72 62 00 4 LAMO - 15 - 10
DM5

Radial Drive Shaft
Figure 401

TRANSFER GEARBOX - REMOVAL/INSTALLATION

1. General

This procedure describes the removal and installation of the transfert gearbox.

2. Equipment and Materials

NOTE : Equivalent substitutes may be used instead of the following items.

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B. 2C14712	Fixture, Position - Horizontal Drive Housing
C. Material No.C02-019	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
D.	Torque Wrench 55 - 300 lbf.in. (0.62 - 3.39 m.daN)
Referenced Procedures	
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Door
- 72-64-00, P. Block 401	Horizontal Drive Shaft Assembly
- 79-00-00, P. Block 301	Oil - General

3. Procedure

A. Job Set-Up

(1)Open, safety and tag the appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Removal (Ref. Fig. 401, 402)

(1)Disconnect from transfer gearbox the following :

(a)Scavenge oil tube at 6 o'clock.

NOTE : Removal of the scavenge oil tube will allow oil to drain from transfer gearbox. Collect residual oil in a suitable container.

(b)N1 sensor scavenge oil tube on the right side.

(c)Oil supply tube on the left side.

(2)Remove horizontal drive shaft (Ref. 72-64-00, P. Block 401).

(3)Disconnect horizontal drive shaft housing :

(a)Disconnect forward top and bottom links from the drive shaft housing clevises by removing bolts, washers, and nuts.

(b)Slide horizontal drive shaft housing aft into the accessory gearbox to clear the transfer gearbox by attaching tool, 2C14712G01, to lower clevis with Ball-Lock pin and tapping pusher block with mallet to move the housing.

(c)Remove preformed packing from front of horizontal drive shaft housing.

(4)Remove transfer gearbox and radial drive shaft from fan frame as follows :

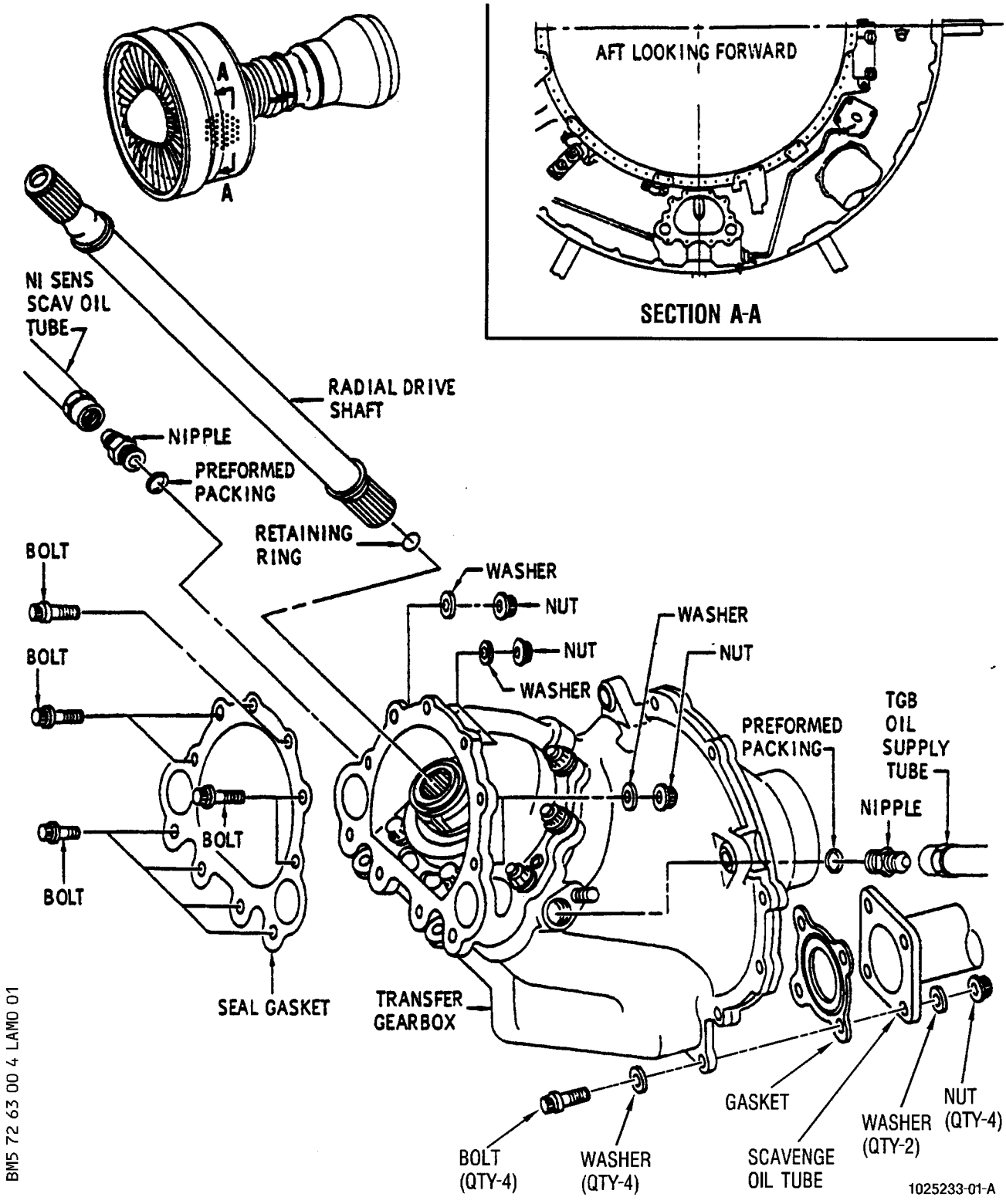
(a)At the 6 o'clock position on the fan frame pad, remove 6 nuts, 6 washers, and 10 bolts securing the transfer gearbox to the fan frame.

(b)Lower and remove the transfer gearbox and radial drive shaft from pas-

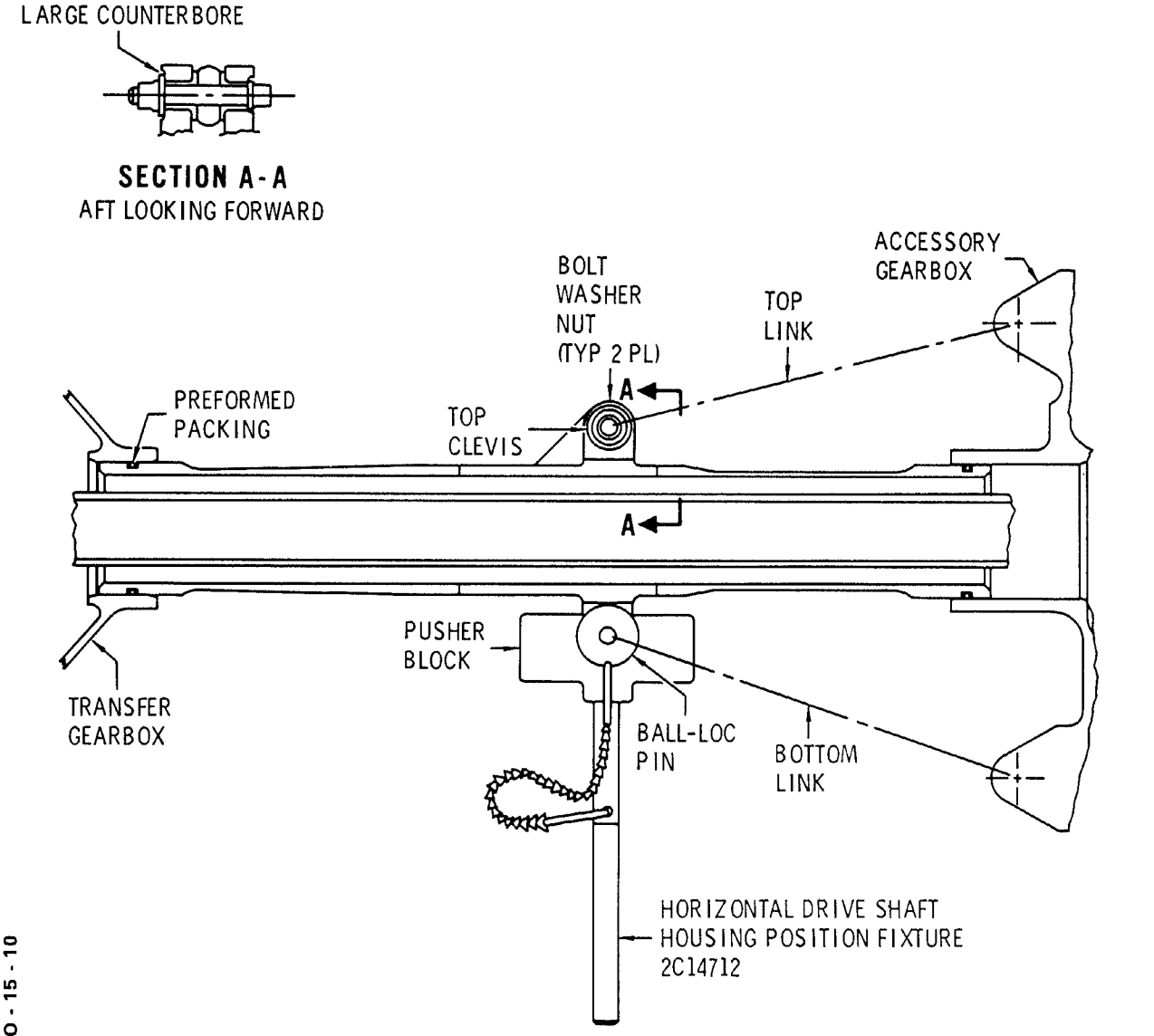
sageway in fan frame strut No. 7. Remove seal gasket.
(c)Separate radial drive shaft from the transfer gearbox.
(d)Remove nipple and preformed packing from N1 sensor scavenge oil port.
(e)Remove nipple and preformed packing from oil supply port.

C. Installation (Ref. Fig. 401, 402)
(1)Installation of transfer gearbox and radial drive shaft.
(a)Assemble two new preformed packings lubricated with engine oil (CO2-019) onto nipples, installing one nipple assembly into oil supply port and the other into N1 sensor scavenge oil port. TORQUE nipples to between 180 and 200 lbf.in. (2.03 and 2.26 m.daN).
(b)Place seal gasket on the transfer gearbox mounting flange.
NOTE : The seal gasket is reusable if the rubber seal is not damaged. Inspect both sides of seal-gasket for cuts, missing pieces, or permanent set. If damaged, replace seal gasket.
(c)Install retaining ring end of the radial drive shaft into the upper gear spline of the transfer gearbox.
(d)Install radial drive shaft and transfer gearbox by carefully inserting the drive shaft into the fan frame strut No. 7 passageway. Align forward splines of the radial drive shaft with the splines of the inlet gearbox.
(e)Slide the drive shaft fully forward until the splines engage.
(f)Secure transfer gearbox to fan frame as follows :
1 At the bottom 4-bolt holes, secure transfer gearbox to fan frame with four bolts. TORQUE bolts to between 55 and 70 lbf.in. (0.62 and 0.78 m.daN).
2 Secure transfer gearbox to fan frame at the remaining six attachment points using bolts, washers, and nuts. TORQUE nuts to between 55 and 70 lbf.in. (0.62 and 0.78 m.daN).
(2)Connection of horizontal drive shaft housing.
(a)Lubricate a new preformed packing with engine oil (CO2-019) and install packing into the ring groove in front end of the horizontal drive shaft housing.
(b)Slide horizontal drive shaft housing forward and into transfer gearbox using tool, 2C14712G01.
(c)Align the clevises on the horizontal drive shaft housing with the forward links that are attached to the accessory gearbox.

PRE SB GE 72-209
CAUTION : THE HORIZONTAL DRIVE SHAFT HOUSING MUST BE INSTALLED WITH THE LARGE COUNTERBORES IN THE CLEVISES ON THE LEFT SIDE AND THE SMALL COUNTERBORES ON RIGHT SIDE. THE BOLT HEADS MUST BE SET IN THE SMALL COUNTERBORES, AND THE WASHERS AND NUTS INTO THE LARGE COUNTERBORES.
END PRE SB GE 72-209
POST SB GE 72-209
CAUTION : THE HORIZONTAL DRIVE SHAFT HOUSING MUST BE INSTALLED WITH THE THICK CLEVIS LUG ON THE LEFT SIDE AND THE THIN CLEVIS LUG ON THE RIGHT SIDE. THE BOLT HEADS MUST BE SET ON THE THIN CLEVIS LUG, AND THE WASHERS AND NUTS ON THE THICK CLEVIS LUG.
END POST SB GE 72-209



Transfer Gearbox
Figure 401



BM5 72 63 00 4 LCMO - 15 - 10
DM5

Horizontal Drive Shaft Housing
Figure 402

1 Attach links to housing clevises with bolts, washers and nuts. Install bolt heads on right side (aft looking forward) with washers and nuts on left.

2 TORQUE nuts to between 100 and 130 lbf.in. (1.13 and 1.47 m.daN).

(3)Install horizontal drive shaft (Ref. 72-64-00, P. Block 401).

(4)Connect the following items to the transfer gearbox :

(a)Connect the transfer gearbox scavenge oil tube to the transfer gearbox using gasket, bolts, washers and nuts. Install four bolts with four washers on forward side. Install two washers on lower bolts with four nuts on aft side. TORQUE nuts to between 55 and 70 lbf.in. (0.62 and 0.78 m.daN).

(b)On the right side of the transfer gearbox, connect N1 sensor scavenge oil tube. TORQUE coupling nut to between 270 and 300 lbf.in. (3.05 and 3.39 m.daN).

(c)On the left side of the transfer gearbox, connect transfer gearbox oil supply tube. TORQUE coupling nut to between 270 and 300 lbf.in. (3.05 and 3.39 m.daN).

C. Leak Check

(1)Perform engine idle leak check (Ref. 71-00-00, P. Block 501).

D. Lubrication

(1)Service lube system (Ref. 79-00-00, P. Block 301).

E. Close-Up

(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(2)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301). Remove safety clips and tags and close circuit breakers.

TRANSFER GEARBOX ASSEMBLY - INSPECTION/CHECK

1. General

Inspection of the transfer gearbox assembly is limited to exposed external areas when the engine is installed. Those items which are accessible are covered in this section.

2. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

3. Procedure

A. Job Set-Up

(1) Open, safety and tag the appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Visual Inspection/Check

(1) Visually inspect the following. Confirm suspected cracks by spot/fluorescent - penetrant inspection.

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(a) Main Housing and Adapters for :		
1 Cracks	Not serviceable	
2 Nicks, dents or scratches	Any number 0.035 in. (0.89 mm) deep	
(b) Housing Studs for :		
1 Loose or missing	Not serviceable	
(c) Lube fittings and plugs for :		
1 Leakage	Not serviceable	Tighten fitting or replace packing.

C. Close-Up

(1) Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(2) Close thrust reverser and fan cowl doors. Remove safety clips and tags and close appropriate circuit breakers (Ref. 71-13-00, P. Block 301).

HORIZONTAL DRIVESHAFT ASSEMBLY - REMOVAL/INSTALLATION

1. General

This procedure pertains to the removal and installation of the horizontal driveshaft and housing.

2. Equipment and Materials

ITEM	DESIGNATION
A. 2C14107	Fixture - Removal/Install, Accessory Gearbox Module
B. 2C14712	Fixture - Horizontal Driveshaft Housing, Position
C. Material No.C02-019	Antiseize Compounds, Lubricants, Oils (Ref. 70-00-00)
Referenced Procedures	
- 71-00-00, P. Block 501	Power Plant - General
- 72-63-00, P. Block 401	Transfer Gearbox
- 80-13-01, P. Block 401	Pneumatic Starter

3. Procedure

A. Job Set-Up

Remove pneumatic starter (Ref. 80-13-01, P. Block 401).

B. Removal (Ref. Fig. 401)

(1) Insert removal tool, 2C14107, through the gearshaft at the accessory gearbox starter pad and into the horizontal driveshaft until the stop on the tool contacts the end of the driveshaft.

(2) Rotate handle on tool clockwise until tool is locked into place.

(3) Carefully withdraw the driveshaft from the aft side of the accessory gearbox.

NOTE : The forward spline on the driveshaft must pass through a rubber dam in the forward end of the accessory gearbox gearshaft. Significant hand pressure may be required to pull the shaft through the dam. On the aft side of the dam, the driveshaft spline must be aligned with the spline in the gearshaft.

(4) Remove removal tool, 2C14107.

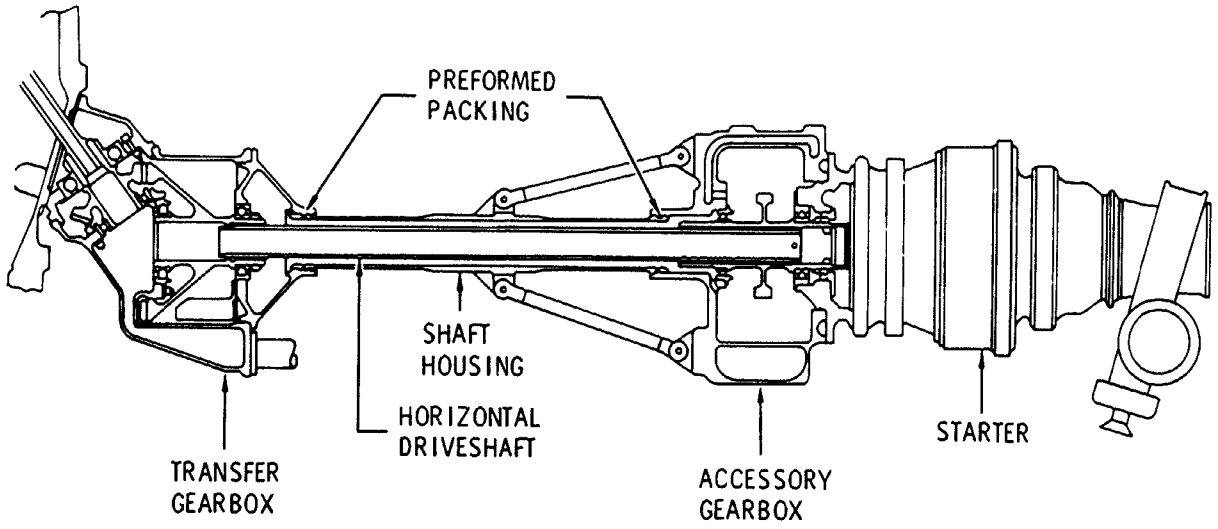
C. Installation (Ref. Fig. 401)

(1) Install tool, 2C14107, into aft end of driveshaft and rotate handle clockwise to lock in place.

NOTE : The aft end of the driveshaft has 1/4 in. (6.4 mm) holes on each side of the shaft.

(2) Carefully insert driveshaft through the accessory gearbox starter pad gearshaft and slide it forward until the front splines of the gearshaft engage with the transfer gearbox splines.

NOTE : The forward spline on the driveshaft must pass through a rubber dam in the forward end of the accessory gearbox gearshaft.



DM5 72 64 00 4 LAMO - 13 - 08
DM5

Horizontal Driveshaft - Removal/Installation
Figure 401

Significant hand pressure may be required to push the shaft through the dam.

(3)Align the rear splines of the driveshaft with the gearshaft splines in the accessory gearbox. Slide the drive shaft fully forward until the splines engage.

(4)Remove installation tool, 2C14107.

D. Removal of Horizontal Driveshaft Housing (Ref. Fig. 402)

(1)Job set-up

Remove the Transfer Gearbox Assembly (Ref. 72-63-00, P. Block 401).

NOTE : This procedure also removes the horizontal driveshaft and disconnects the upper and lower links.

(2)Move the horizontal driveshaft housing forward out from the accessory gearbox assembly.

(3)Remove and discard both preformed packings from the forward and aft ring grooves on the driveshaft housing.

E. Installation of Horizontal Driveshaft Housing (Ref. Fig. 402)

(1)Lubricate new preformed packings with Material No.C02-019, and install packings into the ring grooves on the horizontal driveshaft housing.

(2)Install the housing and slide it aft into the accessory gearbox assembly.

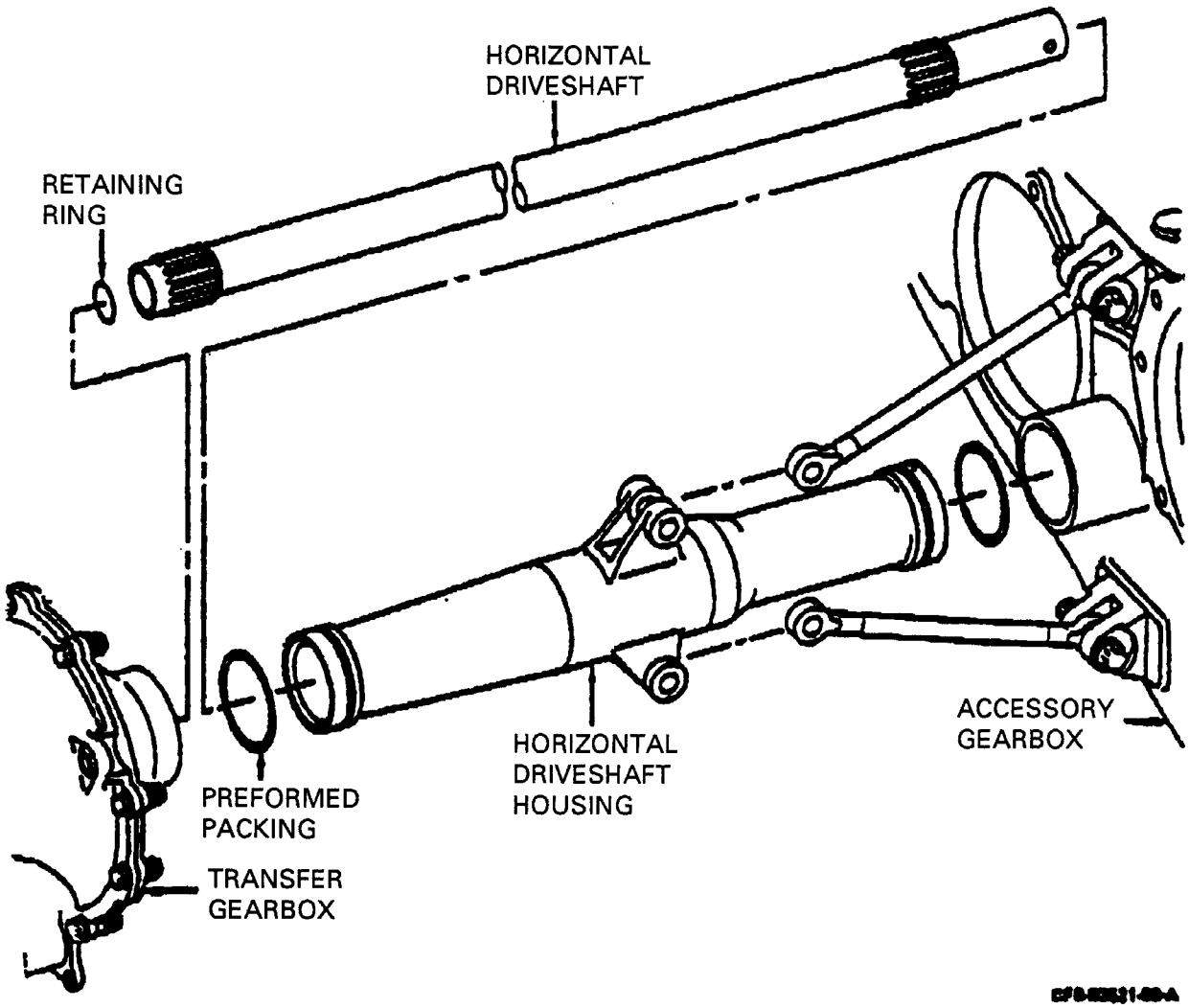
(3)Install the Transfer Gearbox Assembly (Ref. 72-63-00, P. Block 401).

NOTE : This procedure also installs the horizontal driveshaft and connects the upper and lower links.

F. Close-Up and Test

(1)Install pneumatic starter (Ref. 80-13-01, P. Block 401).

(2)Perform test as indicated in "Type of testing after engine component replacement" (Ref. 71-00-00, P. Block 501).



BM5 72 64 00 4 LCMO - 00

Horizontal Driveshaft Housing Assembly
Figure 402

HORIZONTAL DRIVESHAFT ASSEMBLY - INSPECTION/CHECK

1. General
   Inspection of the horizontal driveshaft assembly on installed engines is limited to the exposed external area of the driveshaft housing. Those items which are exposed are covered in this section.

2. Visual Inspection/Check

   A. Visually examine the items that follow. Do an inspection of all cracks. Use the spot fluorescent-penetrant inspection to make sure.

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(1)Housing for :		
(a)Cracks	Not serviceable	Replace housing
(b)Nicks and scratches	No maximum limit if not more than 0.025 in. (0.64 mm) deep	Replace housing
(c)Dents	No maximum limit if not more than 0.025 in. (0.64 mm) deep	Replace housing
(d)Chafing or wear	No maximum limit if not more than 0.025 in. (0.64 mm) deep	Replace housing
(e)Leakage at slip joint	A minor oil wetting is permitted if the oil consumption is not more than limits	Replace packing

HORIZONTAL DRIVESHAFT HOUSING - APPROVED REPAIRS

1. General

A. This procedure gives instructions for the horizontal driveshaft housing approved repairs.

2. Equipment and Materials

ITEM	DESIGNATION
A. 2C14107	Fixture, Horizontal Driveshaft Remove/Installation
B. 2C14712	Fixture, Horizontal Driveshaft Housing, Position
C. Material No.C02-019	Antiseize Compounds, Lubricants, Oils (Ref. 70-00-00)
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 72-64-00, P. Block 401	Horizontal Driveshaft

3. Job Set-Up

WARNING : MAKE SURE YOU OPEN, TAG, AND SAFETY THE APPLICABLE CIRCUIT BREAKERS BEFORE YOU START THE MAINTENANCE PROCEDURES. THIS WILL PREVENT ACCIDENTAL ENGINE START AND/OR THRUST REVERSER OPERATION WHICH CAN CAUSE INJURIES TO PERSONS AND/OR DAMAGE TO THE EQUIPMENT.

A. Open, safety, and tag the appropriate circuit breakers and open the fan cowl and thrust reverser doors (Ref. 71-13-00, P. Block 301).

4. Procedure

A. Remove the horizontal driveshaft (Ref. 72-64-00, P. Block 401).

B. Disconnect the forward top and bottom links from the driveshaft housing clevises by removing the bolts, washers, and nuts.

C. For the replacement of the forward preformed packing, do the procedures that follow (Ref. Fig. 801).
(1)Attach the position fixture to the lower clevis with Ball-Loc pin. Move the horizontal dirveshaft housing aft into accessory gearbox as far as necessary to remove the preformed packing.
(2)Remove and discard the preformed packing from the ring groove on the horizontal driveshaft housing.
(3)Lubricate a new preformed packing with Material No.C02-019 and install the packing into the ring groove on the horizontal driveshaft housing.
(4)Move the horizontal driveshaft housing forward and into the transfer gearbox.

D. For the replacement of the aft preformed packing, do the procedures that follow (Ref. Fig. 801).

(1)Attach the position fixture to the lower clevis with a Ball-Loc pin. Move the horizontal driveshaft housing forward into the transfer gearbox as far as necessary to remove the preformed packing.
(2)Remove and discard the preformed packing from the ring groove on the horizontal driveshaft housing.
(3)Lubricate a new preformed packing with Material No.C02-019 and install the packing into the ring groove on the horizontal driveshaft housing.
(4)Move the horizontal driveshaft housing aft, and into the accessory gearbox assembly.

E. Install the horizontal driveshaft housing as follows :

CAUTION : ALTERNATIVE CONFIGURATION AVAILABLE. THE HORIZONTAL DRIVESHAFT HOUSING MUST BE INSTALLED WITH LARGE COUNTERBORES IN THE CLEVISES ON THE LEFT SIDE AND THE SMALL COUNTERBORES ON THE RIGHT SIDE. THE BOLT HEADS MUST BE SET IN THE SMALL COUNTERBORES, AND WASHERS AND NUTS IN THE LARGE COUNTERBORES.

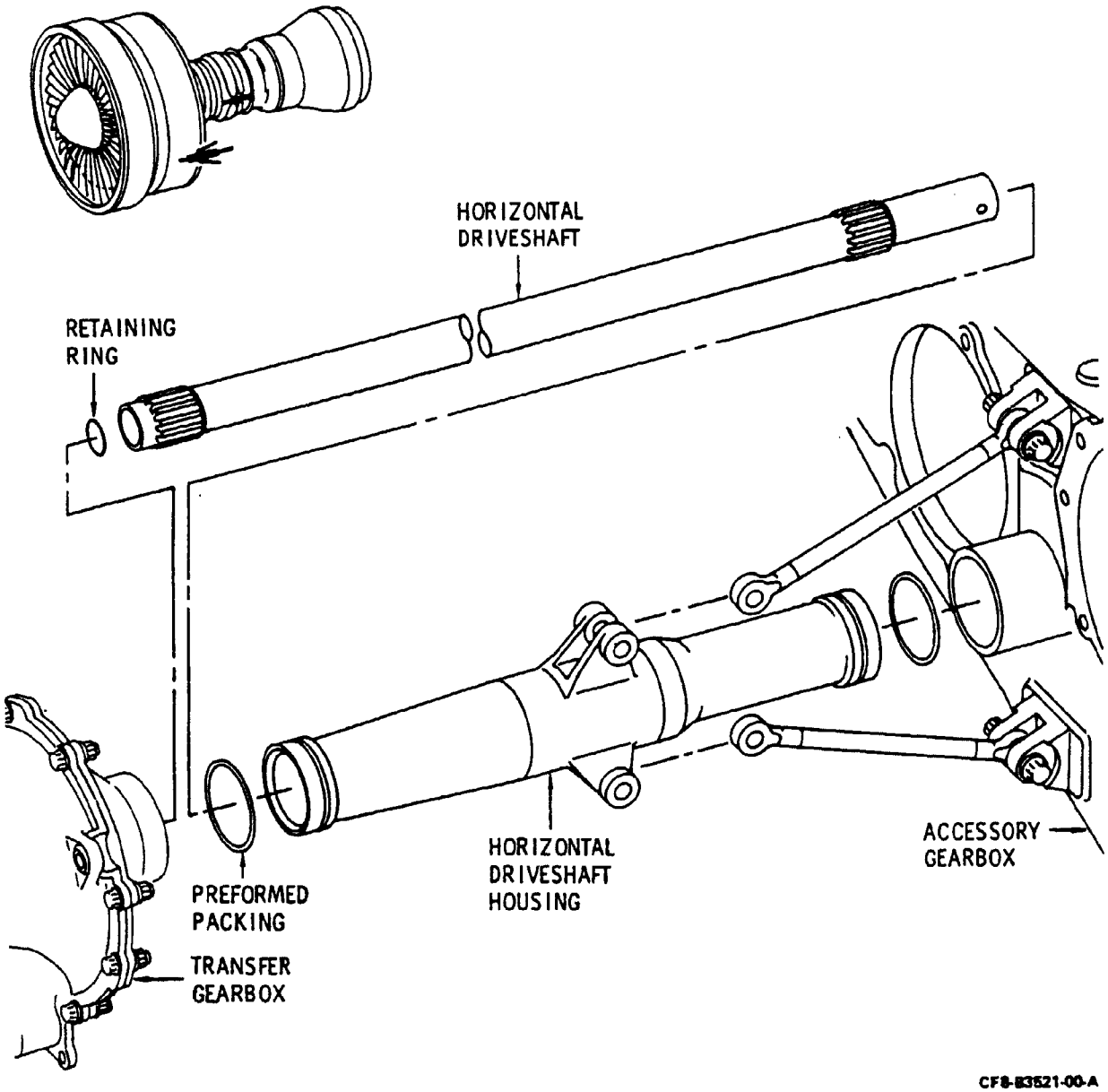
CAUTION : THE HORIZONTAL DRIVE SHAFT HOUSING MUST BE INSTALLED WITH THE THICK CLEVIS LUG ON THE LEFT SIDE AND THE THIN CLEVIS LUG ON THE RIGHT SIDE. THE BOLTHEADS MUST BE ON THE THIN CLEVIS LUG, AND THE WASHERS AND NUTS ON THE THICK CLEVIS LUG.

(1)Align the clevises on the horizontal driveshaft housing with the forward links that are attached to the accessory gearbox.
(2)Attach links to housing clevises with bolts, washers, and nuts. Install the bolt heads on the right side (aft looking forward), with the washers and nuts on left. TORQUE nuts to between 100 and 130 lbf.in. (1.13 and 1.47 m.daN).

5. Close-Up

A. Remove all the tools and equipment from the work area. Make sure the area is clean and clear of all miscellaneous items.

B. Close the fan cowl and thrust reverser doors and remove safety clips, tags, and close the appropriate circuit breakers (Ref. 71-13-00, P. Block 301).



Horizontal Driveshaft Housing
Figure 801

ACCESSORY GEARBOX ASSEMBLY - ADJUSTMENT/TEST

1. General

The adjustments and test given in this procedure are the only adjustments and test authorized at the on-line maintenance level.

2. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breakers Safety Clips
B.	Torque Wrench 24-27 lbf. in. (0.27 - 0.31 m.daN)
C. 2C14124	Fixture - Seal/Pressurized Accessory Gearbox
D. Material No.C02-033	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 72-65-00, P. Block 801	Accessory Gearbox Assembly
- 72-64-00, P. Block 401	Horizontal Drive Shaft Assembly
- 80-13-01, P. Block 401	Pneumatic Starter

3. Procedure

A. Job Set-Up

(1)Open, safety and tag the appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

(2)Remove horizontal drive shaft (Ref. 72-64-00, P. Block 401).

B. Adjustment Test (Ref. Fig. 501, 502)

(1)Install seal/pressurize fixture, 2C14124G02, as follows :

(a)Lubricate three preformed packings on the fixture with Material No.C02-033.

NOTE : The preformed packing on the fixture pilot is identical to that used on the starter pilot.

(b)Insert fixture through the starter pad gearshaft and into the horizontal drive shaft housing.

(c)Attach fixture to starter pad with the V-band clamp for the starter.

(d)Turn tightening handles clockwise to expand seal inside the horizontal drive.

(e)Attach the fixture pressure gauge and regulator subassembly to the quick disconnect on the fixture mounting plate.

(2)Disconnect the carbon seal drain lines at the accessory gearbox and replace with flexible hoses. Immerse the ends of the hoses in a bucket of water.

WARNING : DO NOT USE AN OXYGEN BOTTLE AS A PRESSURE SOURCE. OXYGEN CAN CREATE AN EXPLOSIVE CONDITION.

(3)Attach a source of dry air or nitrogen to the fitting on the regulator. Set pressure to read 10-11 psi (68.9-75.8 kPa) on the fixture gauge. Observe bubble rate in buckets.

NOTE : The fixture has a built-in relief valve to protect against overpressure.

(a)A slow bubble rate of 1 to 15 bubbles per minute is acceptable. This does not indicate a seal leak. It does indicate a seal that has lost its oil film or a new seal not yet seated to its mating ring.

(b)A bubble rate of over 15 bubbles per minute is not acceptable. Replace seal.

NOTE : During the pressure test, drainage from the fuel pump may be experienced on high time pumps. To alleviate this condition, start boost pump or shut off fuel valve in pylon. Approximately one gallon (3.8 l) of drainage may be expected after shutoff valve is closed.

(4)Remove and replace carbon seal (Ref. 72-65-00, P. Block 801).

(5)Repeat pressure test.

(6)Remove fixture, 2C14124G02, and place in storage container.

C. Close-Up

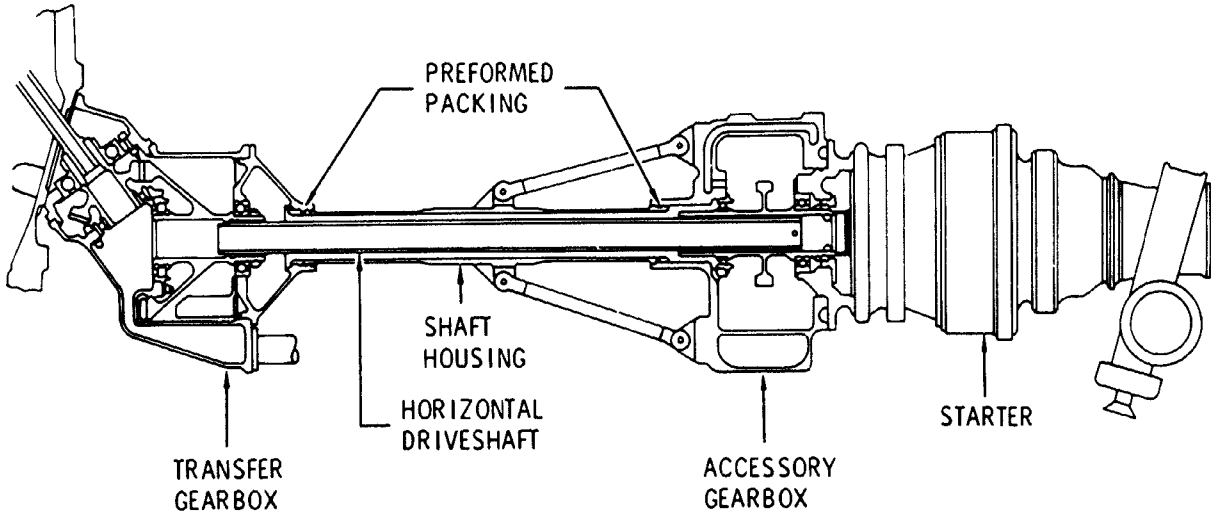
(1)Install horizontal drive shaft (Ref. 72-64-00, P. Block 401).

(2)Install pneumatic starter (Ref. 80-13-01, P. Block 401).

(3)Connect carbon seal drain lines.

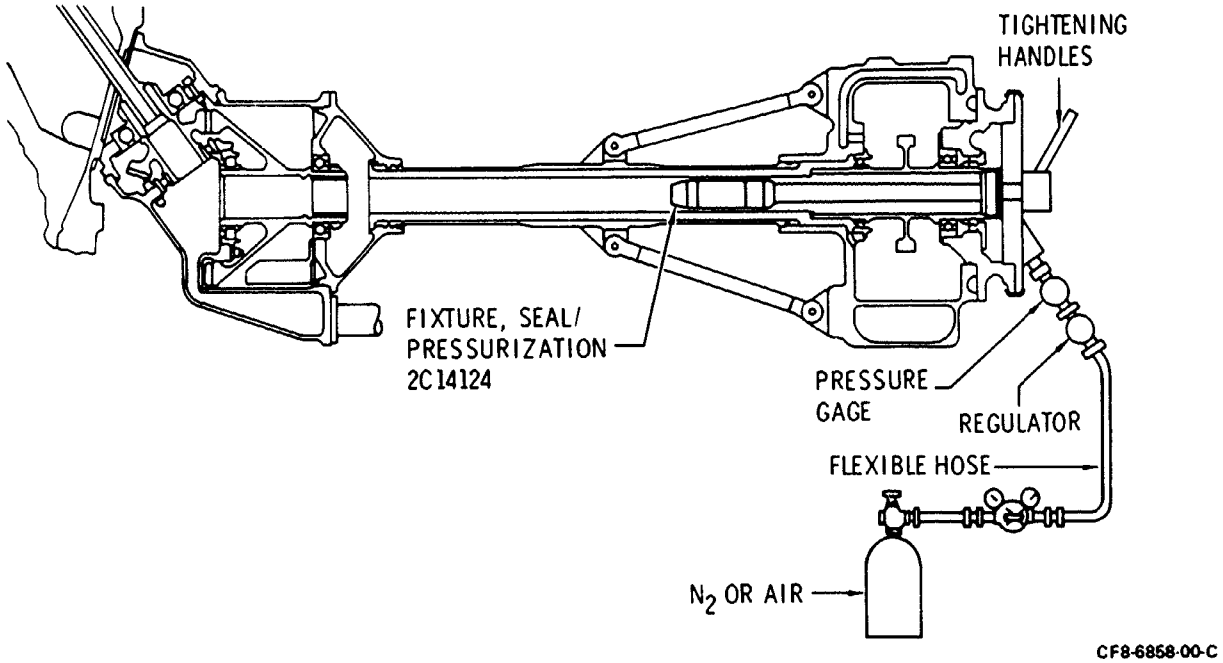
(4)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(5)Remove safety clips and tags and close circuit breakers. Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).



BM5 72 65 00 5 LAMO - 13 - 08
DM5

Carbon Seal Leakage Testing Access
Figure 501



BM5 72 65 00 5 LCMO - 13 - 08
DM5

Carbon Seal Leakage Testing - Test Set-Up
Figure 502

ACCESSORY GEARBOX ASSEMBLY - INSPECTION/CHECK

R 1. General

R A. This procedure gives the inspection/check instructions for the gearbox
R assembly. The procedure will cover external visual inspection of the
R areas that follow :
R - Gearbox main housing and adapters.
R - Internal visual inspection of the AGB.
R - AGB control alternator adapter package.
R - Lube fitting and plugs.
R - Fluid fitting inserts at the lube supply ports.
R - Housings and adapter studs.

R 2. Equipment and Materials

R ITEM	DESIGNATION
R A.	Circuit Breaker Safety Clips
R B.	Access Platform 8 ft.2in. (2.5 m)
R C.	Protective Eyewear and Gloves
R D.	Flexible borescope - Commercial borescope equipment that meets the GE borescope specification
R E. Material No.C03-006	Finishes and Protective Coatings (Ref. 70-00-00)
R F. Material No.C04-035	Cleaning Compounds and Solvents (Ref. 70-00-00)
R Referenced Precedures	
R - 71-00-00, P. Block 401	Power Plant - General
R - 71-00-00, P. Block 501	Power Plant - General
R - 71-13-00, P. Block 301	Cowl Doors
R - 72-65-00, P. Block 801	Accessory Gearbox Assembly
R - 73-24-01, P. Block 401	Control Alternator Stator and Rotor Assembly
R - 73-24-01, P. Block 601	Control Alternator Stator and Rotor Assembly

R 3. Procedure (Ref. Fig. 601, 602, 603)
R (Ref. Fig. 604, 605)

A. Visually inspect the following. Confirm suspected cracks by spot fluorescent-penetrant inspection.

INSPECTION/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
(1) Main Housing and Adapters for :		
R (a) Cracks	Not serviceable	Replace the engine
R (b) Nicks, dents or scratches	Any number 0.035 in. (0.89 mm) deep	Replace the engine
R (c) Area below the adapter	Flange can be wet with oil if the engine	If the rate of engine oil consump-

INSPECTION/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
R flange is wet with oil	oil quantity is in limits	tion is more than the limit, replace the engine (Ref. 71-00-00, P. Block 401)
(2) Lube Fittings and Plugs for :		
(a) Leakage	Not serviceable	Tighten fitting or replace packing
(3) Fluid Fitting Insert at Lube Supply Port for :		
R (a) Loose	Not serviceable	Replace the insert
R (b) Leakage	Not serviceable	Replace the insert
(4) Housing and Adapter Studs for :		
R (a) Loose	Not serviceable	Retorque the studs
R (b) Missing	Not serviceable	Replace the stud
(5) AGB Mounts for :		
(a) Misalignment	Permitted up to 0.025 in. (0.64 mm)	Replace if damage is more than limits
(b) Protrusion of bushings beyond inner surface of clevis	Permitted up to 0.050 in. (1.27 mm) with other flange seated	Replace if damage is more than limits
(c) Inner surface of gearbox top mount clevis	0.100 in. (2.54 mm)	Replace if damage is more than limits

R B. Accessory Gearbox Internal Inspection

R (1)Examine the accessory gearbox as follows :

R (a)Remove the control alternator (Ref. 73-24-01, P. Block 401).

R (b)Remove the control alternator adapter package (Ref. 72-65-00, P. Block 801).

R 1 If the drive shaft is loose within the bearings of the control alternator adapter package, then a bearing failure has most likely occurred. Make record of the number and condition of rolling elements (balls) that are contained in the rear or internal bearing closest to the alternator drive shaft gear.

R 2 If the accessory gearbox scavenge inlet screen was previously removed before, get any unwanted material.

R 3 Do an inspection of the control alternator adapter package (Ref. 72-65-00, P. Block 601).

R (c)Do a visual inspection inside the accessory gearbox for :

R CAUTION : WHEN YOU REMOVE CONTAMINATION OR DOA FLUSH FOR CONTAMINATION REMOVAL, KEEP IT FOR INSPECTIONS YOU DO LATER. IT IS VERY IMPORTANT TO FIND ALL BEARING ROLLING ELEMENTS (BALLS) IN

THE CASE OF A REAR OR INTERNAL BEARING FAILURE IN THE CONTROL ALTERNATOR DRIVE ADAPTER.

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
1 Unwanted material or particles at the bottom of the gearbox	Not permitted.	Remove unwanted material by mechanical means (i.e. tweezers, magnetic probe) and flush with Material No.C04-035.
2 AGB oil scavenge tube for unwanted material	Not permitted.	Remove unwanted material by mechanical means (i.e. tweezers, magnetic probe) and Flush tube with Material No.C04-035.
3 Lube and scavenge pump accessory gearbox scavenge inlet for unwanted material	Not permitted.	Remove unwanted material by mechanical means (i.e. tweezers, magnetic probe) and Flush tube with Material No.C04-035.
4 For bearing failure, get the total number of rolling elements (balls) from the rear or internal bearing.		You must find all bearing balls and remove them. Borescope the AGB thru pad No.9, with the control alternator adapter package removed. Remove unwanted material (balls) by mechanical means (i.e. tweezers, magnetic probe). If the total number of rolling elements (balls) from the rear or internal bearing are not found, then replace the engine (Ref. 71-00-00, P. Block 401).

NOTE : 360 degrees inspection of the mating gear teeth is necessary. Turn the mating gear using the HP compressor (N2) rotor manual cranking procedure.

(d)You will turn the engine core (N2) during inspection of the mating gear teeth by use of N2 rotor manual crank procedure (Ref. 71-00-00, P. Block 501).

(e)Examine the gearbox internal mating gear teeth as follows :

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
1 Internal mating gear teeth for :		
- Cracks	Not permitted.	Replace the engine (Ref. 71-00-00, P. Block 401).
- Nicks, dings and scratches	Not permitted.	Replace the engine (Ref. 71-00-00, P. Block 401).
- Excessive wear on contact surfaces	Not permitted.	Replace the engine (Ref. 71-00-00, P. Block 401).
- Uneven wear on gear teeth	Not permitted.	Replace the engine (Ref. 71-00-00, P. Block 401).
- Scoring	Not permitted.	Replace the engine (Ref. 71-00-00, P. Block 401).
- Evidence of overheating	Not permitted.	Replace the engine (Ref. 71-00-00, P. Block 401).
- Presence of debris or particles on the gear teeth	Not permitted.	Replace the engine (Ref. 71-00-00, P. Block 401).

(f)Install the control alternator adapter package (Ref. 72-65-00, P. Block 801).
(g)Install the control alternator (Ref. 73-24-01, P. Block 401).
(h)Remove the equipment that was used to manually the N2 rotor manual crank procedure (Ref. 71-00-00, P. Block 501).
1 Install the cover plate with the new packing.

C. Examine the Control Alternator Adapter Package as follows :
(1)Examine the accessory gearbox control alternator as follows :
(a)Remove the control alternator (Ref. 73-24-01, P. Block 401).
1 If the stator cannot be removed from the adapter, then a rotor stator rub and interference has occurred. Do the steps that follow :
- Remove the control alternator adapter package (Ref. 72-65-00, P. Block 801).
- Perform accessory gearbox internal inspection (Ref. 72-65-00, P. Block 601).
- Install the control alternator adapter package (Ref. 72-65-00, P. Block 801).

(b)Remove the control alternator adapter package (Ref. 72-65-00, P. Block 801).
(c)Do a visual inspection of the control alternator rotor (Ref. 73-24-01,

P. Block 601).

(d)Do a visual inspection of the control alternator adapter package (installed) for :
(Ref. Fig. 601, 602, 603)
(Ref. Fig. 604, 605)
NOTE : You must replace the drive adapter assembly if the conditions are not within the limits.

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
1 Adapter for :		
- Fretting with the stator housing	No defects more than 0.003 in. (0.0761 mm) in depth are permitted.	Replace the control alternator adapter package (Ref. 72-65-00, P. Block 801).
- Loose studs	Not permitted.	Replace the control alternator adapter package (Ref. 72-65-00, P. Block 801).
- Nicks, dings, or high metal on the stator mating face	Scratches and dents up to 0.020 in. (0.51 mm) are permitted.	Put a cover on bearing and shaft assembly and remove raised metal by filing or stoning flush with adjacent material. Put a layer of chromate conversion alodine (Material No.C03-006) on the reworked area.
- Scratches across the o-ring mounting surfaces	Not permitted.	Replace the control alternator adapter package (Ref. 72-65-00, P. Block 801).
- Unwanted material	Not permitted.	Replace the control alternator adapter package (Ref. 72-65-00, P. Block 801). Perform internal inspection of the accessory gearbox (Ref. 72-65-00, P. Block 601).
2 Drive shaft for :		
- Drive flats for wear	Allowable to a depth of 0.002 in. (0.05 mm) and width of 0.080 in. (2.03 mm).	If the damage is more than the limit, replace the control alternator adapter package (Ref. 72-65-00, P. Block 801).
- Damaged threads	Chase damaged threads. Allowable	If the damage is more than the limit, replace

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
	damage is up to 1/2 thread cumulative or continuous may be missing after chasing threads.	the control alternator adapter package (Ref. 72-65-00, P. Block 801).
- Forward pilot diameter	Must be between 0.5110 - 0.5116 in. (12.98 - 13.00 mm).	If the damage is more than the limit, replace the control alternator adapter package (Ref. 72-65-00, P. Block 801).
- Aft pilot diameter	Must be between 0.8743 - 0.8749 in. (22.07 - 22.22 mm).	If the damage is more than the limit, replace the control alternator adapter package (Ref. 72-65-00, P. Block 801).
- Excessive side play	Total side play must not be more than 0.003 in. (0.076 mm).	If the damage is more than the limit, replace the control alternator adapter package (Ref. 72-65-00, P. Block 801).
- Bearing spanner nut for (POST SB GE 72-1260)	Looseness when checked by hand ; nut must not be loose.	If the damage is more than the limit, replace the control alternator adapter package (Ref. 72-65-00, P. Block 801).

(e)Inspect the bearing retention fasteners :

1 Apply 40 lbf.in. (0.45 m.daN) torque in the tightening direction to each bearing retention fastener.

- If all fasteners turn, replace the control alternator adapter package (Ref. 72-65-00, P. Block 801).

2 Apply 110 lbf.in. (1.24 m.daN) torque in the tightening direction to each bearing retention fastener.

- If any fastener rotates, tighten all fasteners again as follow :
  - . Remove all fasteners.
  - . Lubricate the threads and contact surfaces of the fasteners with Material No.C02-019.
  - . Reinstall the fasteners hand tight.
  - . TORQUE the fasteners to between 110 and 120 lbf.in. (1.24 and 1.36 m.daN) above run-on torque.

(f)This section is optional unless you do inspections or maintenance

on the alternator drive adapter due to OIL FILTER CLOG indication, rotor-stator rub, or debris on the magnetic chip detector :

1 Replace the control alternator adapter package (Ref. 72-65-00, P. Block 801).

WARNING : SOLVENTS ARE TOXIC TO THE SKIN, EYES AND RESPIRATORY TRACT. SKIN, EYE AND RESPIRATORY PROTECTION ARE REQUIRED. AVOID REPEATED OR PROLONGED CONTACT.

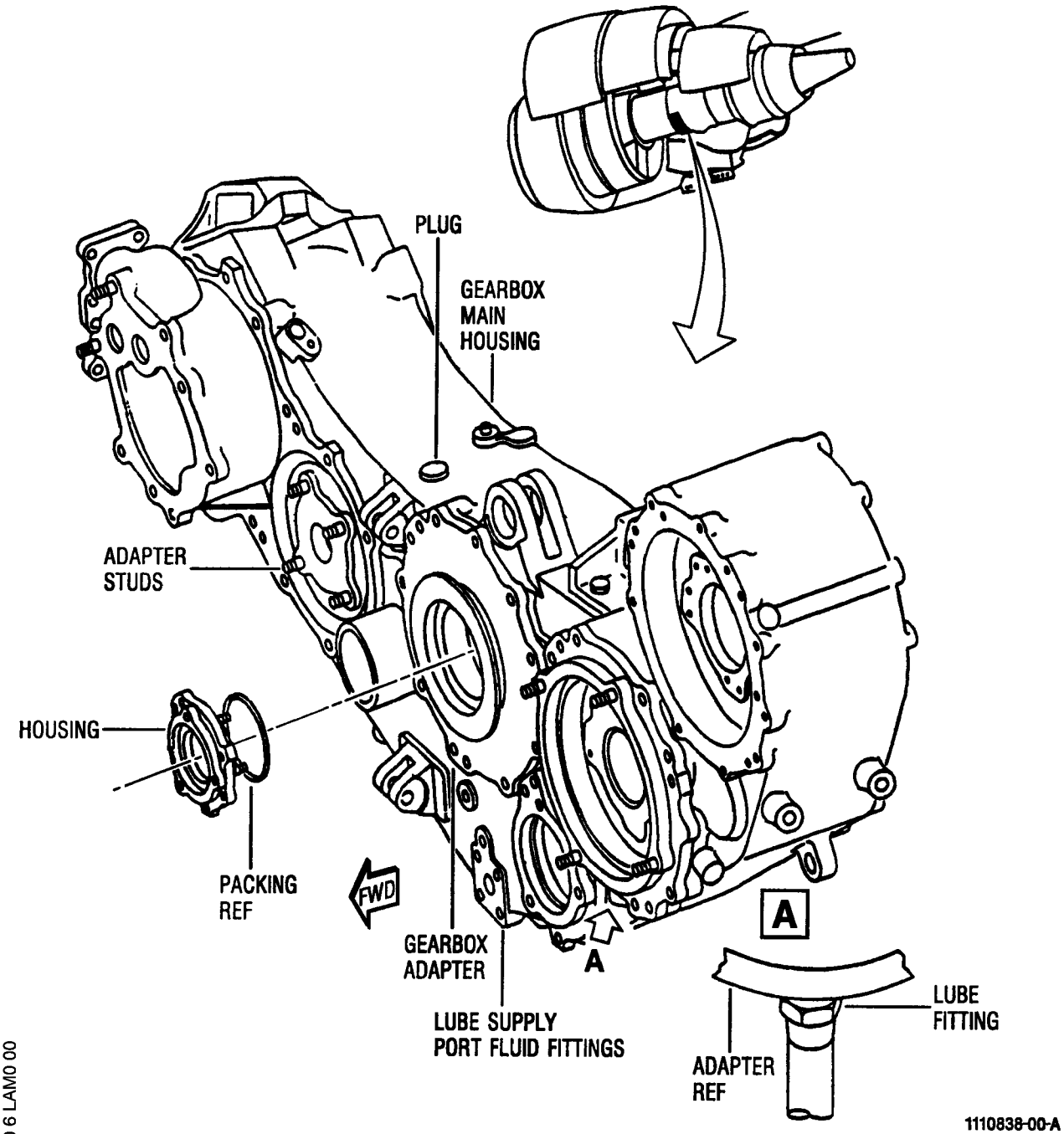
2 Do a visual inspection of the control alternator adapter package (removed) for :

NOTE : You must replace the control alternator adapter package if the conditions are not within the limits.

INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
a Adapter for :		
- Fretting with the gearbox mounting pad	No defects more than 0.003 in. (0.076 mm) in depth are permitted.	If the damage is more than the limit, replace the control alternator adapter package (Ref. 72-65-00, P. Block 801).
- Nicks, dings, or high metal on AGB mating face	Scratches and dents up to 0.020 in. (0.51 mm) are permitted.	Remove raised metal by filing or stoning flush with adjacent material. Put a coat of chromate conversion alodine (Material No.C03-006) on the area you worked on.
- Scratches across the o-ring mounting surfaces	Not permitted.	Replace the control alternator adapter package (Ref. 72-65-00, P. Block 801).
b Gear teeth for :		
- Cracks	Not permitted.	Replace the control alternator adapter package (Ref. 72-65-00, P. Block 801).
- Nicks, dings and scratches	Not permitted.	Replace the control alternator adapter package (Ref. 72-65-00, P. Block 801).
- Excessive wear on contact surfaces	Not permitted.	Replace the control alternator adapter package (Ref. 72-65-00, P. Block 801).
- Uneven wear on gear teeth	Not permitted.	Replace the control alternator adapter package (Ref. 72-65-00, P. Block 801).

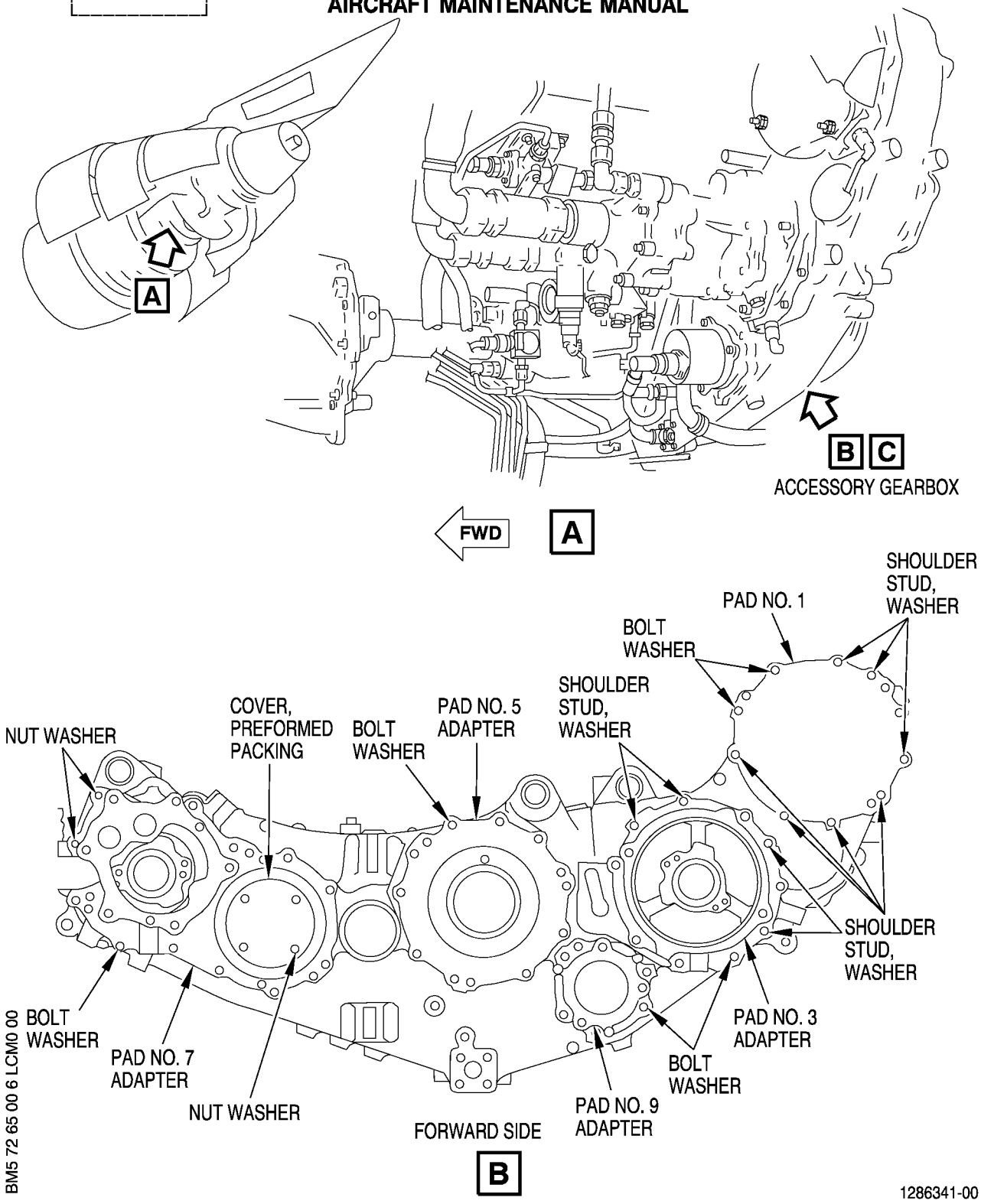
INSPECT/CHECK	MAXIMUM SERVICEABLE LIMITS	REMARKS
		Inspect mating gear on inside of gearbox for damage. If you do not see wear on the mating gear, replace the control alternator adapter package (Ref. 72-65-00, P. Block 801). If wear is found on the mating gear, then replace engine within the next 25 flight cycles, after replacement of drive adapter.
- Scoring	Not permitted.	Replace the control alternator adapter package (Ref. 72-65-00, P. Block 801).
- Evidence of overheating	Not permitted.	Replace the engine (Ref. 71-00-00, P. Block 401).
c Bearing for :		
- Turn shaft by hand. Movement should be smooth.	No rough movement is permitted.	If the movement is rough when you turn the shaft, replace the control alternator adapter package (Ref. 72-65-00, P. Block 801).
d Oil wetted surfaces of the shaft, gear, bearing, and adapter for :		
- Unwanted material	Not permitted.	Replace the control alternator adapter package (Ref. 72-65-00, P. Block 801).
- Unwanted material on gear teeth	Not permitted.	Replace the engine (Ref. 71-00-00, P. Block 401).

(g)Install the control alternator adapter package (Ref. 72-65-00, P. Block 801).
(h)Install the control alternator (Ref. 73-24-01, P. Block 401).



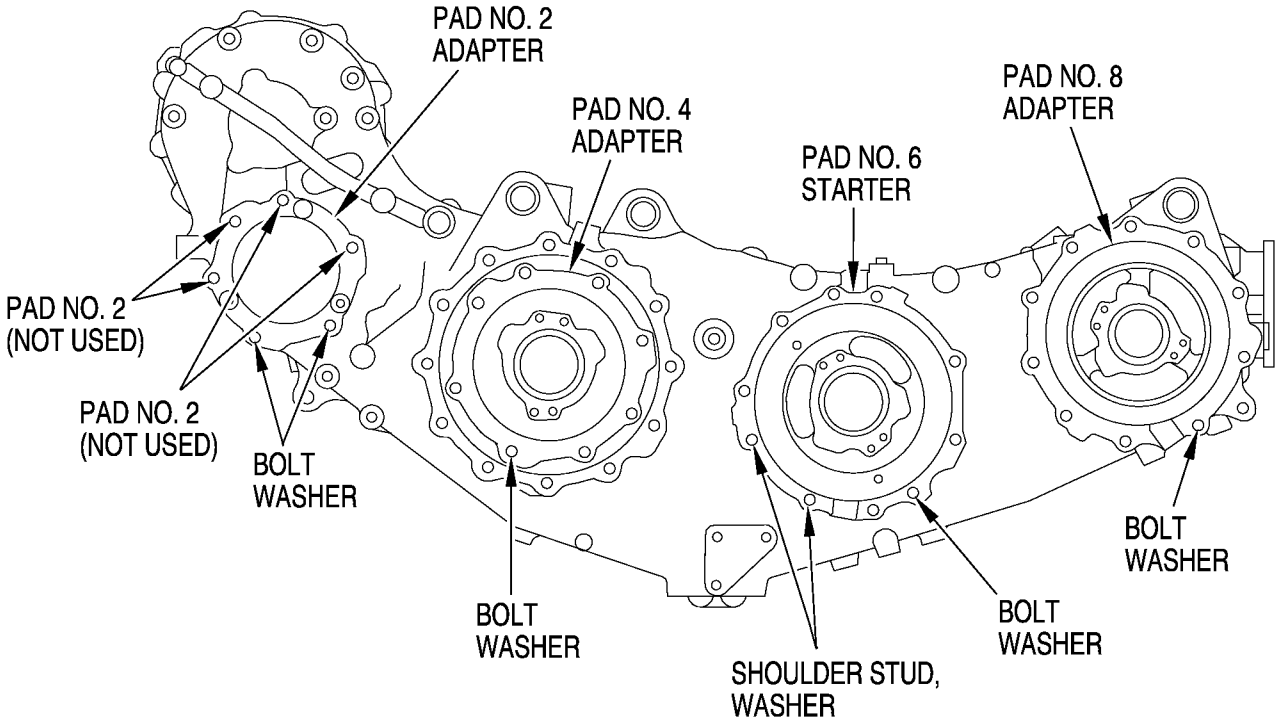
BM5 72 65 00 6 LAM0 00

R Accessory Gearbox
Figure 601



Accessory Gearbox
Figure 602

R



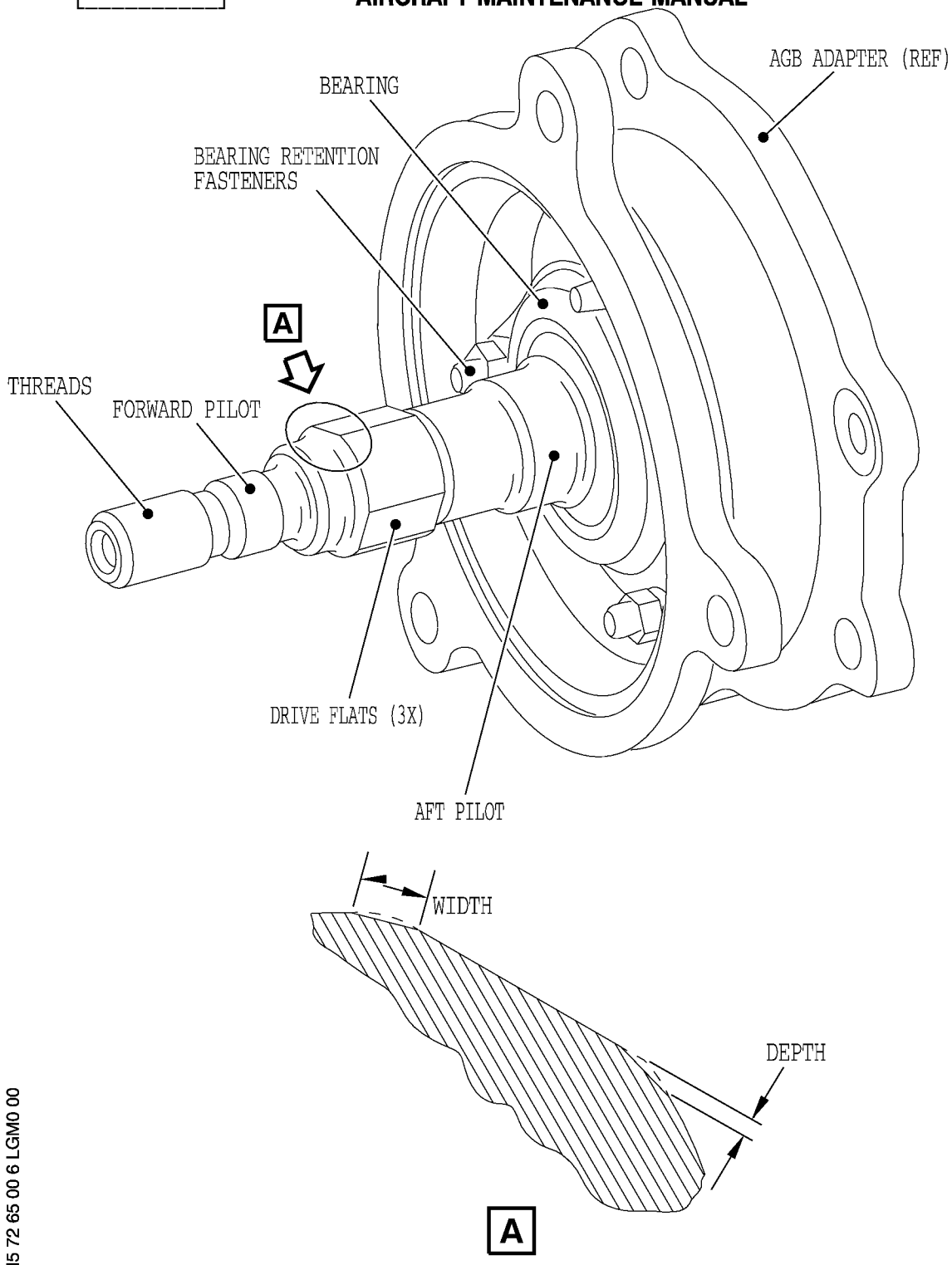
NOTE:
ACCESORIES OMITTED FOR CLARITY.

1286342-00

BM5 72 65 00 6 LEM0 00

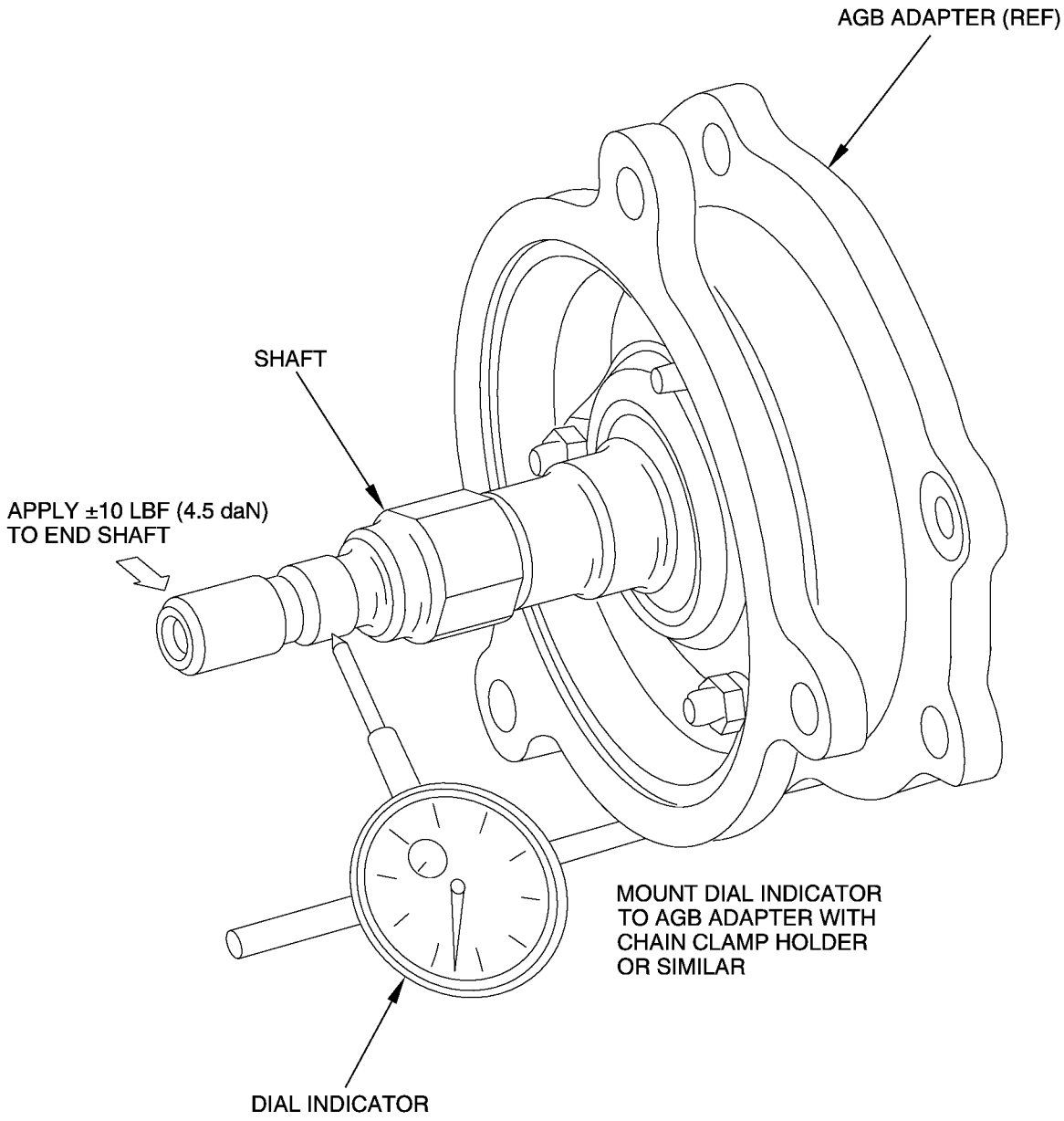
R

Accessory Gearbox
Figure 603



R

Accessory Gearbox
Figure 604



BM5 72 65 00 6 LJM0 00

1286699-00

R Accessory Gearbox
Figure 605

1. Replacement of Accessory Gearbox Drive Pad Magnetic Seals and Carbon Seals

A. Equipment and Materials

ITEM	DESIGNATION
(1)	Circuit Breaker Safety Clips
(2)2C14639	Tool Set, Removal - Magnetic Seals Accessory Gearbox
(3)2C14137	Tool Set, Install ABG Carbon Seal Mating Ring
(4)2C14138	Tool Set, Remove ABG Carbon Seal Mating Ring
(5)Material No.C02-007	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
(6)Material No.C02-019	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
Referenced Procedures	
- 24-11-11, P. Block 401	Integrated Drive Generator (IDG)
- 29-11-32, P. Block 401	Hydraulic Pump
- 71-00-00, P. Block 501	Power Plant - General
- 72-65-00, P. Block 501	Accessory Gearbox Assembly
- 73-12-01, P. Block 401	Fuel Pump
- 73-21-01, P. Block 401	Main Engine Control
- 80-13-01, P. Block 401	Pneumatic Starter

B. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Remove the applicable accessory from the gearbox drive pad.
(a)Remove fuel pump (Ref. 73-12-01, P. Block 401).
(b)Remove main engine control (Ref. 73-21-01, P. Block 401).
(c)Remove starter (Ref. 80-13-01, P. Block 401).
(d)Remove hydraulic pump (Ref. 29-11-32, P. Block 401).
(e)Remove integrated drive generator (IDG) (Ref. 24-11-11, P. Block 401).

C. Procedure - Magnetic Seal
(1)Removal of seal adapter and magnet as follows (Ref. Fig. 801)
(a)Remove nuts and washers that secure seal adapter to accessory gearbox.
(b)Remove seal adapter and magnet from accessory gearbox using four jackscrews with 0.250-28 UNF threads. Withdraw adapter evenly to avoid damage.
NOTE : The magnet normally should remain with the seal adapter when it is removed. If, in some cases, the magnet remains on the shaft, it can be removed with the seal case.
(c)Place seal adapter and magnet in plastic bag to prevent collection of foreign material on the magnet.
(2)Removal of the seal case and performed packing (Ref. Fig. 802)
(a)Identify the correct puller from tool set, 2C14639, for applicable drive pad.

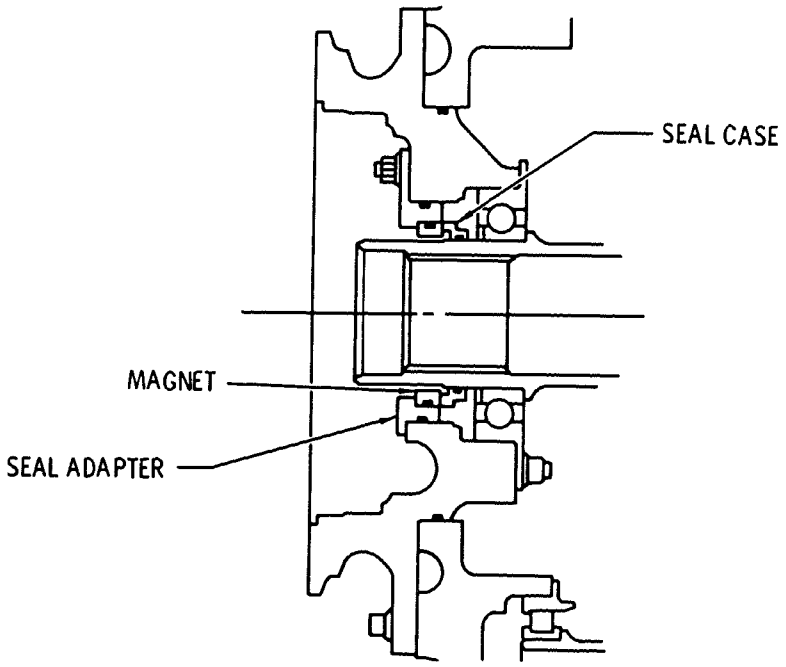
NOTE : The appropriate puller has the name of the drive pad metal-stamped on its surface in typewritten capital letters.

COMPONENT REMOVED	USE TOOL NUMBER
Fuel Pump	2C14139P05
Main Engine Control	2C14139P04
Starter	2C14139P04
Hydraulic Pump	2C14139P05
IDG	2C14139P04

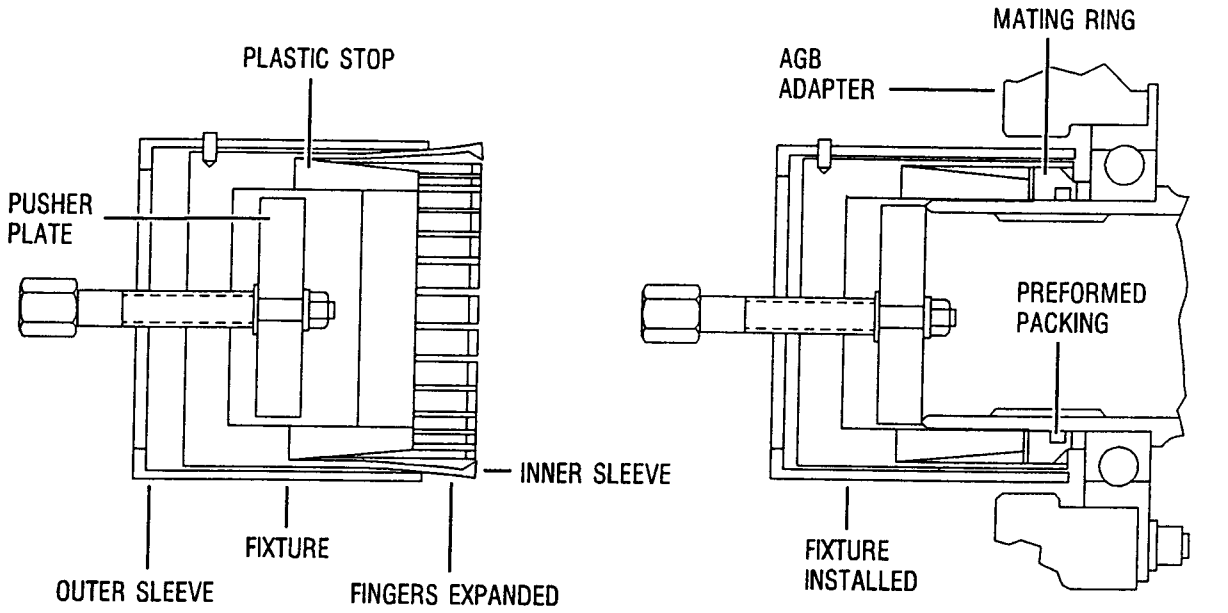
(b)Retract removal tool pusher plate by turning the screw counterclockwise to the end of its travel.
(c)Slide the outer sleeve back allowing the flexible fingers of the inner sleeve to expand.
(d)Make sure the appropriate plastic stop is installed in the inner sleeve. If the magnet was not removed with the seal adapter but remained on the shaft, install the shorter stop in place of the longer one that is normally used.
(e)Apply a light coat of Material No.C02-019 to the inner sleeve, outer sleeve, and screw threads.
(f)Insert tool into the seal cavity until the plastic stop contacts the seal case.
(g)Slide the outer sleeve over the inner sleeve closing the flexible fingers on the seal case.
NOTE : A plastic hammer, if used gently, may be used to assist sliding the outer sleeve over the inner sleeve.
(h)Torque the screw clockwise with a ratchet wrench and 1/2 -inch socket or equivalent until the seal case is pulled loose from the shaft.
R (j)Remove seal case from puller by sliding the outer sleeve back to allow the fingers to release the seal case. Discard the seal case packing and place the seal case in plastic bag with magnet and seal adapter.
CAUTION : DO NOT APPLY MATERIAL No.C02-019 OR MATERIAL No.C02-007 ON POLISHED FACE OF MAGNET OR SEAL CASE.

(3)Installation of magnetic seal into accessory gearbox.
(a)Install new preformed packing coated with Material No.C02-019 on adapter.
(b)Clean magnet with tissue paper. Coat new preformed packing with Material No.C02-007 and install on magnet.
(c)Install magnet in adapter with polished face on outside.
(d)Install new preformed packing coated with Material No.C02-007 in seal case.
(e)Carefully place the polished surface of the magnet against the seal case. Align the bore of the magnet with inner diameter of seal case.
CAUTION : DO NOT TAP MAGNETIC SEAL ADAPTER OR GEARSHAFT DURING INSTALLATION AS IT COULD UNSEAT THE SEALING FACES.
CAUTION : DO NOT APPLY EXCESSIVE PRESSURE ON THE CLAMPED SEAL DURING INSTALLATION. EXCESSIVE PRESSURE WILL DEFORM THE SEAL, RESULTING IN OIL LEAKAGE.

(f)Install magnetic seal assembly over hub of gearshaft and into bore of



Accessory Gearbox Magnetic Seal Installation (Typical)
Figure 801



BM5 72 65 00 8 LCMO - 01

Seal Case Removal Fixture 2C14639
Figure 802

housing.

(g)Install washers and nuts securing magnetic seals to housing. Tighten nuts in a criss-cross pattern to evenly draw seal assembly and seat seal flange against pad face. TORQUE nuts to between 55 and 70 lbf. in. (0.62 and 0.79 m.daN).

(h)Check clearance between magnet and adapter for less than 0.003 in. (0.08 mm) using a feeler gage.

D. Remove the AGB Drive Pad Carbon Seal and Ring

(1)Removal of carbon seal assembly as follows:
(Ref. Fig. 803, 804, 806).

CAUTION : USE SYMMETRICAL PRESSURE TO REMOVE THE CARBON SEAL ASSEMBLY, DAMAGE TO EQUIPMENT CAN OCCUR.

(a)Remove nuts and washers that secure seal adapter assembly to accessory gearbox.

(b)Remove seal adapter assembly from accessory gearbox using four jackscrews with 0.250-28 UNF threads. Withdraw adapter evenly to avoid damage.

(c)Place seal adapter and magnet in plastic bag to prevent collection of foreign material on the magnet.

(2)Removal of the seal case and preformed packing

(a)Identify the correct puller from tool set 2C14138 for applicable drive pad.

NOTE : The appropriate puller has the name of drive pad metalstamped on its surface in typewritten capital letters.

COMPONENT REMOVED	USE TOOL NUMBER
Fuel Pump	2C14138G01
Main Engine Control	2C14138G01
Starter	2C14138G02
Hydraulic Pump	2C14138G01
IDG	2C14138G02

(b)Retract removal tool pusher plate by turning the screw counterclockwise to the end of its travel.

(c)Slide the outer sleeve back allowing the flexible fingers of the inner sleeve to expand.

(d)Make sure that the plastic stop is installed in the inner sleeve.

(e)Apply a light coat of Material No.C02-019 to the inner sleeve, outer sleeve, and screw threads.

(f)Put the removal tool into the empty space where the carbon seal was installed.

(g)Apply pressure on the removal tool until the plastic stop touches the mating ring.

(h)Move the outer sleeve over the inner sleeve, the flexible fingers will close over the mating ring.

NOTE : A plastic hammer, if used gently, may be used to assist sliding the outer sleeve over the inner sleeve.

R (j)Torque the screw clockwise with a ratchet wrench and 1/2-inch socket or equivalent until the mating ring is pulled loose from the shaft.

R (k)Remove the removal tool.
R (l)Move the outer sleeve back to release the mating ring.
1 Discard the packing and the mating ring.

**ON A/C 001-100,

Post SB 72-2031 For A/C 001-100,

D. Remove the AGB Drive Pad Carbon Seal and Ring
(Ref. Fig. 805)
(1)Open the thrust reverser halves.
(2)Remove the applicable engine accessory:

PAD No.	ACCESSORY	REFERENCE
1 and 3	Hydraulic Pump	29-11-32, P. Block 401
4	IDG	24-11-11, P. Block 401
6	Starter	80-13-01, P. Block 401
7	MEC	73-21-01, P. Block 401
8	Fuel Pump	73-12-01, P. Block 401

(3)Remove the carbon seal.
(a)Remove the nuts that attach the carbon seal assembly.
CAUTION : USE SYMMETRICAL PRESSURE TO REMOVE THE CARBON SEAL ASSEMBLY. DAMAGE TO THE EQUIPMENT CAN OCCUR.
(b)Install two jackscrews to remove the carbon seal assembly.
1 Tighten each jackscrew with a symmetrical pressure.
(c)Remove the carbon seal assembly.
(d)Remove and discard the preformed packing.
(e)Remove the jackscrews.
(4)Remove the mating ring (Ref. Fig. 807)
(a)Identify the correct puller from tool set, 2C14638, for applicable drive pad.
NOTE : The appropriate puller has the name of the drive pad metal-stamped on its surface in typewritten capital letters.

COMPONENT REMOVED	USE TOOL NUMBER
Fuel Pump	2C14138G01
Main Engine Control	2C14138G01
Starter	2C14138G02
Hydraulic Pump	2C14138G01
IDG	2C14138G02

(b)Do the steps that follow to prepare the removal tool.
1 Turn the screw in the removal tool counterclockwise to retract the pusher plate.
2 Move the outer sleeve back to let the flexible fingers of the inner sleeve expand.

3 Make sure the applicable plastic stop is installed in the inner sleeve.
4 Apply a light layer of engine oil to the inner sleeve, outer sleeve, and screw threads.
(c)Put the removal tool into the empty space where the carbon seal was installed.
1 Apply pressure on the removal tool until the plastic stop touches the mating ring.
(d)Move the outer sleeve over the inner sleeve. The flexible fingers will close over the mating ring.
NOTE : A plastic hammer, if used lightly, can be used to help move the outer sleeve over the inner sleeve.
(e)Use a ratchet wrench with a 1/2 in. socket to tighten the screw in a clockwise direction.
1 Tighten until you pull the mating ring off of the shaft.
(f)Remove the removal tool.
1 Move the outer sleeve back to release the mating ring.
2 Discard the preformed packing.

**ON A/C 001-100,

R E. Install the AGB Drive Pad Carbon Seal and Ring
R (1)Installation of carbon spring seal into accessory gearbox (Ref. Fig. 803, 804, 806).
R (a)Do the steps that follow to install the mating ring:
R 1 Install new preformed packing coated with Material No.C02-019 on adapter.
R 2 Install new preformed packing coated with the new mating ring.
R 3 Use appropriate installation tool from the list that follows to install the mating ring:

COMPONENT REMOVED	TOOL NUMBER
Fuel Pump	2C14137G01
Main Engine Control	2C14137G01
Starter	2C14137G02
Hydraulic Pump	2C14137G01
IDG	2C14137G02

R CAUTION : DO NOT APPLY EXCESSIVE PRESSURE ON THE CLAMPED SEAL DURING INSTALLATION. EXCESSIVE PRESSURE WILL DEFORM THE SEAL, RESULTING IN OIL LEAKAGE.
R 4 Use the proper installation tool to hold the outer diameter of the mating ring.
R 5 Insert the installation tool over the gearshaft until it touches the inner race of the bearing.
R CAUTION : THE TANGS ON MATING RING MUST ENGAGE WITH THE SLOTS IN THE INNER BEARING RACE. DAMAGE TO CARBON SEAL CAN OCCUR IF THE INSTALLATION TOOL IS NOT FULLY ENGAGED.
R 6 Turn the installation tool until the tangs of the mating ring engage

R the slots in the bearing inner race.
R (b)Do the steps that follow to install the carbon seal assembly:
R 1 Apply a light layer of petrolatum grease to the new packing.
R 2 Install the packing on the groove on the outer diameter of the carbon seal assembly.
R 3 Lubricate the inner diameter of the empty adapter pad with Material No.CO2-019.
R 4 Lubricate the internal elements of the carbon seal assembly with Material No.CO2-019.
R 5 Flex the seal assembly several times to ensure lubrication of all the internal components.
R 6 Apply a light layer of Material No.CO2-019 to the face of carbon seal assembly and the face of the mating ring.
R 7 Align the carbon seal assembly with the gearbox studs.
R 8 Carefully push the carbon seal assembly into the bore of the adapter pad.
R 9 Apply pressure on the carbon seal assembly until it engages with the adapter pad. TORQUE the nuts to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN).

**ON A/C 001-100,

Post SB 72-2031 For A/C 001-100,

E. Install the AGB Drive Pad Carbon Seal and Ring.
(1)Install the mating ring (Ref. Fig. 807).
(a)Do the steps that follow to install the mating ring:
1 Apply a light layer of engine oil to the new preformed packing.
2 Install the preformed packing on the new mating ring.
3 Use the installation tool from the list that follows to install the mating ring:

COMPONENT REMOVED	USE TOOL NUMBER
Fuel Pump	2C14137G01
Main Engine Control	2C14137G01
Starter	2C14137G02
Hydraulic Pump	2C14137G01
IDG	2C14137G02

CAUTION : DO NOT APPLY EXCESSIVE PRESSURE ON THE CLAMPED SEAL DURING INSTALLATION. EXCESSIVE PRESSURE WILL DEFORM THE SEAL, RESULTING IN OIL LEAKAGE.

4 Use the installation tool to hold the outer diameter of the mating ring.
5 Insert the installation tool over the gearshaft until it touches the inner race of the bearing.
CAUTION : THE TANGS ON THE MATING RING MUST ENGAGE WITH THE SLOTS IN THE INNER BEARING RACE. DAMAGE TO THE CARBON SEAL RING CAN

OCCUR IF NOT FULLY ENGAGED.

6 Turn the installation tool until the tangs of the mating ring engage the slots in the bearing inner race.

(2)Install the carbon seal assembly (Ref. Fig. 805).

(a)Do the steps that follow to install the carbon seal assembly :

1 Apply a light layer of petrolatum grease to the new preformed packing.

2 Install the packing in the groove on the outer diameter of the carbon seal assembly.

3 Lubricate the inner diameter of the empty adapter pad with engine oil.

4 Lubricate the internal elements of the carbon seal assembly with engine oil.

5 Compass the seal assembly as necessary to make sure that all the internal components are lubricated.

6 Apply a light layer of engine oil to the face of the carbon seal assembly and the face of the mating ring.

7 Align the carbon seal assembly with the gearbox studs.

CAUTION : BE CAREFUL WITH THE PREFORMED PACKING WHEN YOU INSTALL IT. THE PACKING IS EASILY CUT AND TURNED OUT OF POSITION DURING INSTALLATION.

8 Carefully push the carbon seal assembly into the bore of the adapter pad.

9 Apply pressure on the carbon seal assembly until it engages with the adapter pad.

10 Install the nuts on the studs.

- TORQUE the nuts to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN).

(3)Close the thrust reverser.

**ON A/C 001-100,

F. Close-Up and Test

(1)Install accessories, as required, to accessory gearbox drive pad in accordance with the following procedures :

(a)Install fuel pump (Ref. 73-12-01, P. Block 401).

(b)Install main engine control (Ref. 73-21-01, P. Block 401).

R (c)Install starter (Ref. 80-13-01, P. Block 401).

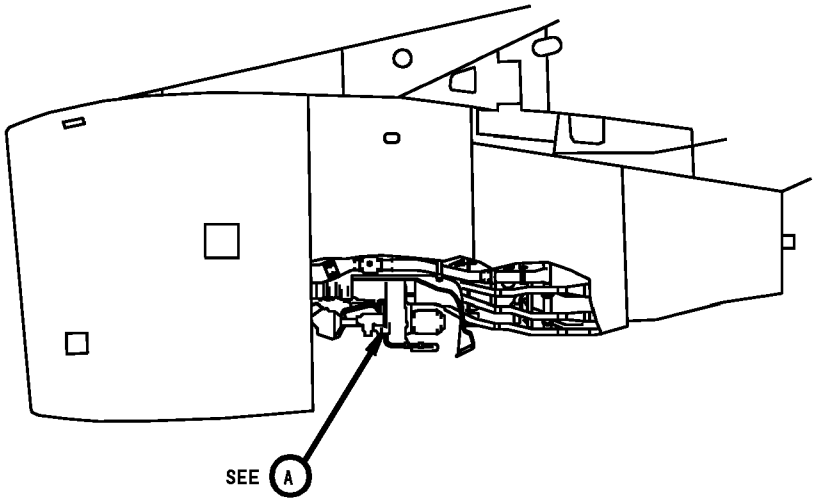
R (d)Install hydraulic pump (Ref. 29-11-32, P. Block 401) and IDG (Ref. 24-11-11, P. Block 401).

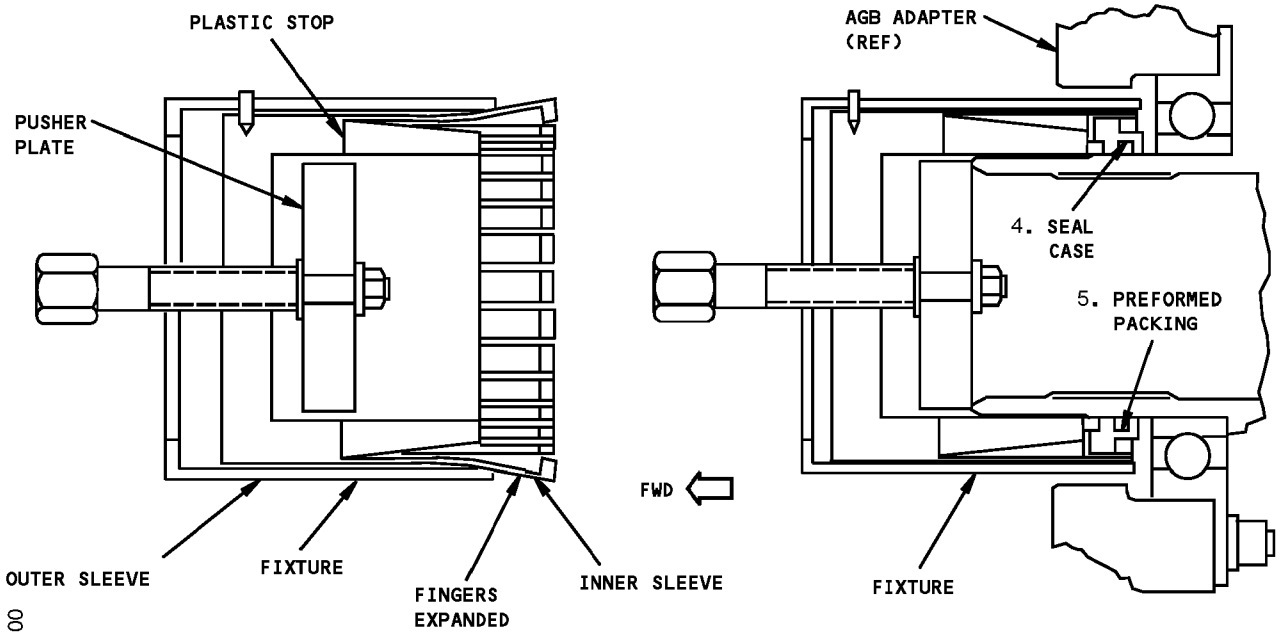
(2)Perform leak test on replacement seal (Ref. 72-65-00, P. Block 501) or as an alternative procedure to the leak test on the replacement seal, do an 83 % power assurance run and ground idle leak test (Ref. 71-00-00, P. Block 501).

(3)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

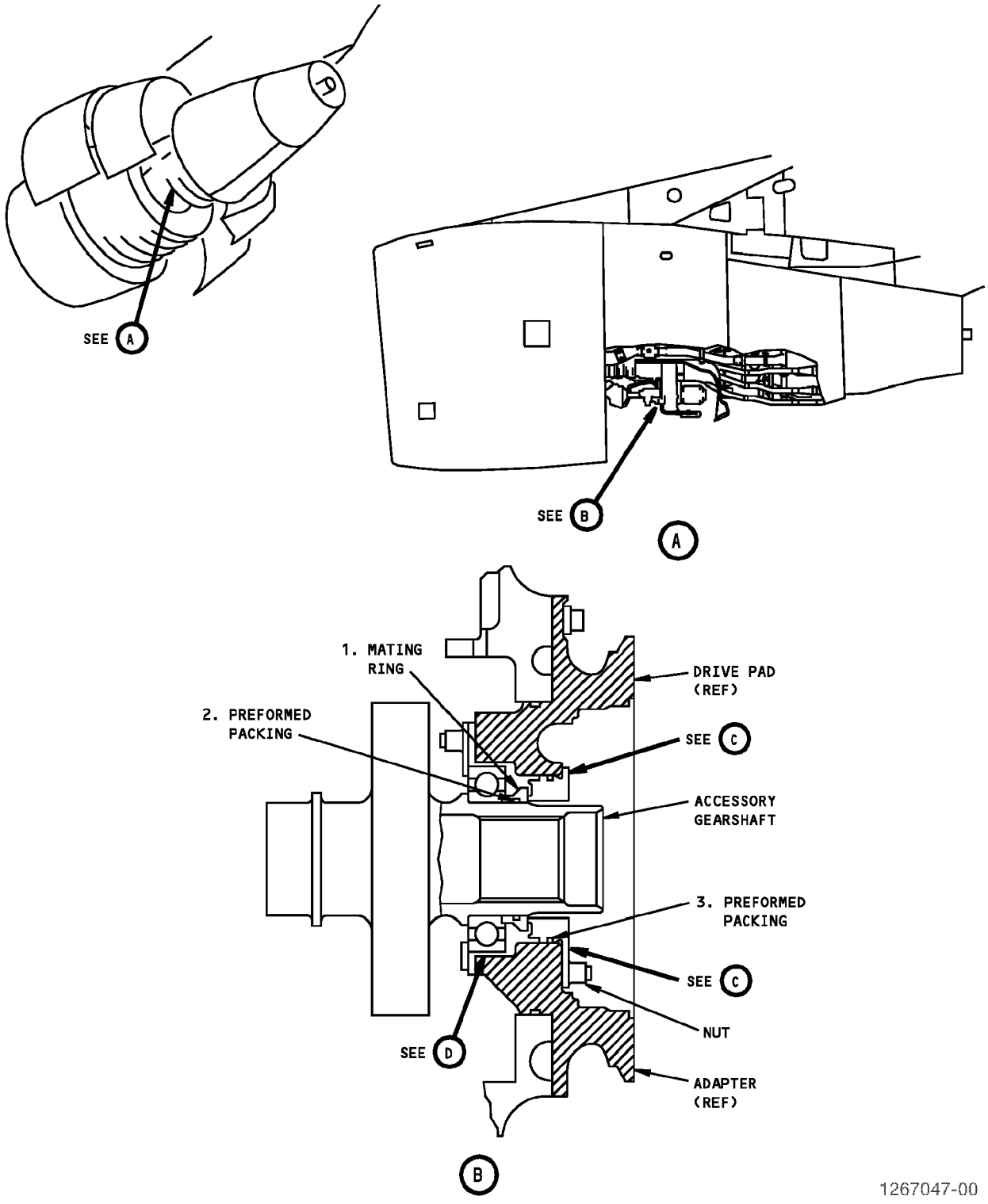
(4)Close thrust reverser and fan cowl doors and remove safety clips and tags and close the appropriate circuit breakers (Ref. 71-13-00, P. Block 301).

2. Replacement of Accessory Gearbox Adapter - Gearshaft Package





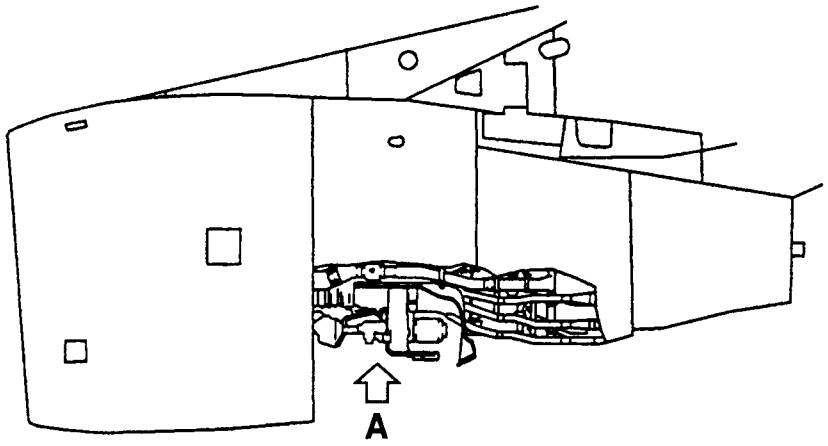
R Carbon Seal Removal/Installation Fixture
Figure 803

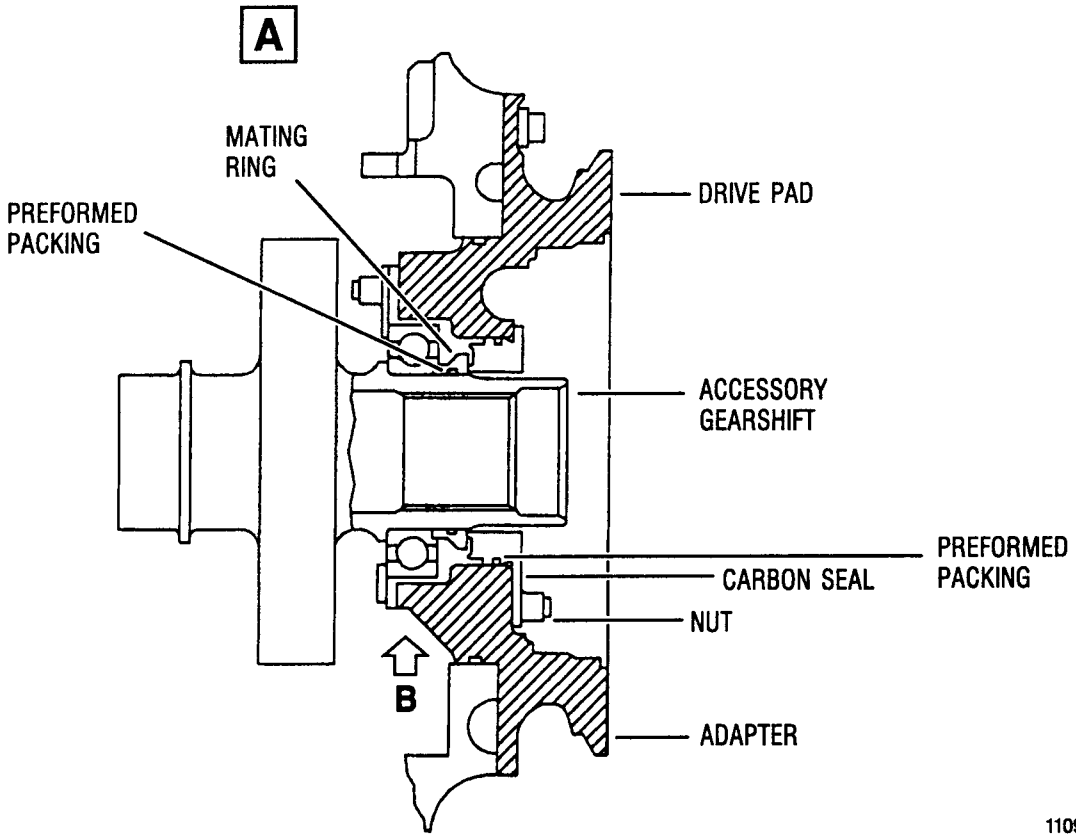


BM5 72 65 00 8 LRMA 00

Carbon Seal and Ring Assembly Installation (Sheet 1/2)
Figure 804

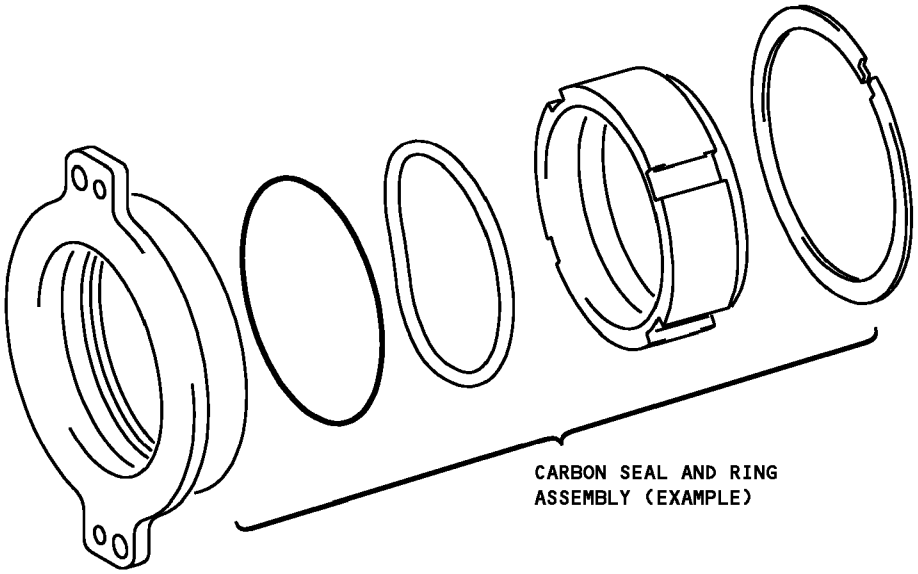
R



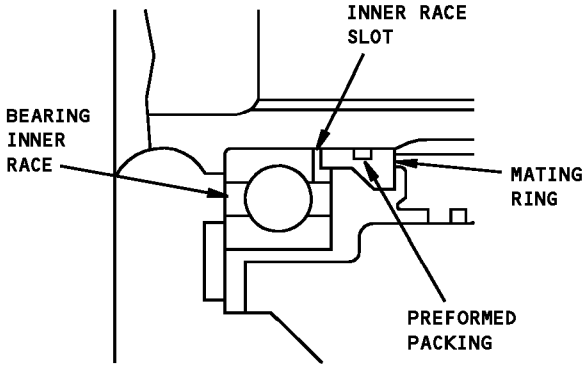


BM5 72 65 00 8 LPMA - 00

Carbon Seal and Ring Assembly Installation (Sheet 1/2)
Figure 805



C



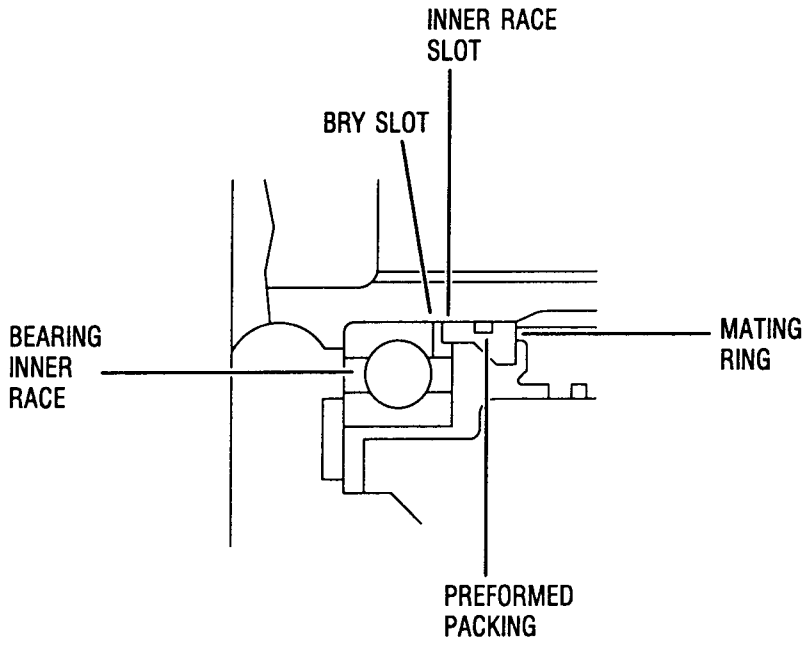
D

1267048-00

BM5 72 65 00 8 LRMJ 00

Carbon Seal and Ring Assembly Installation (Sheet 2/2)
Figure 804

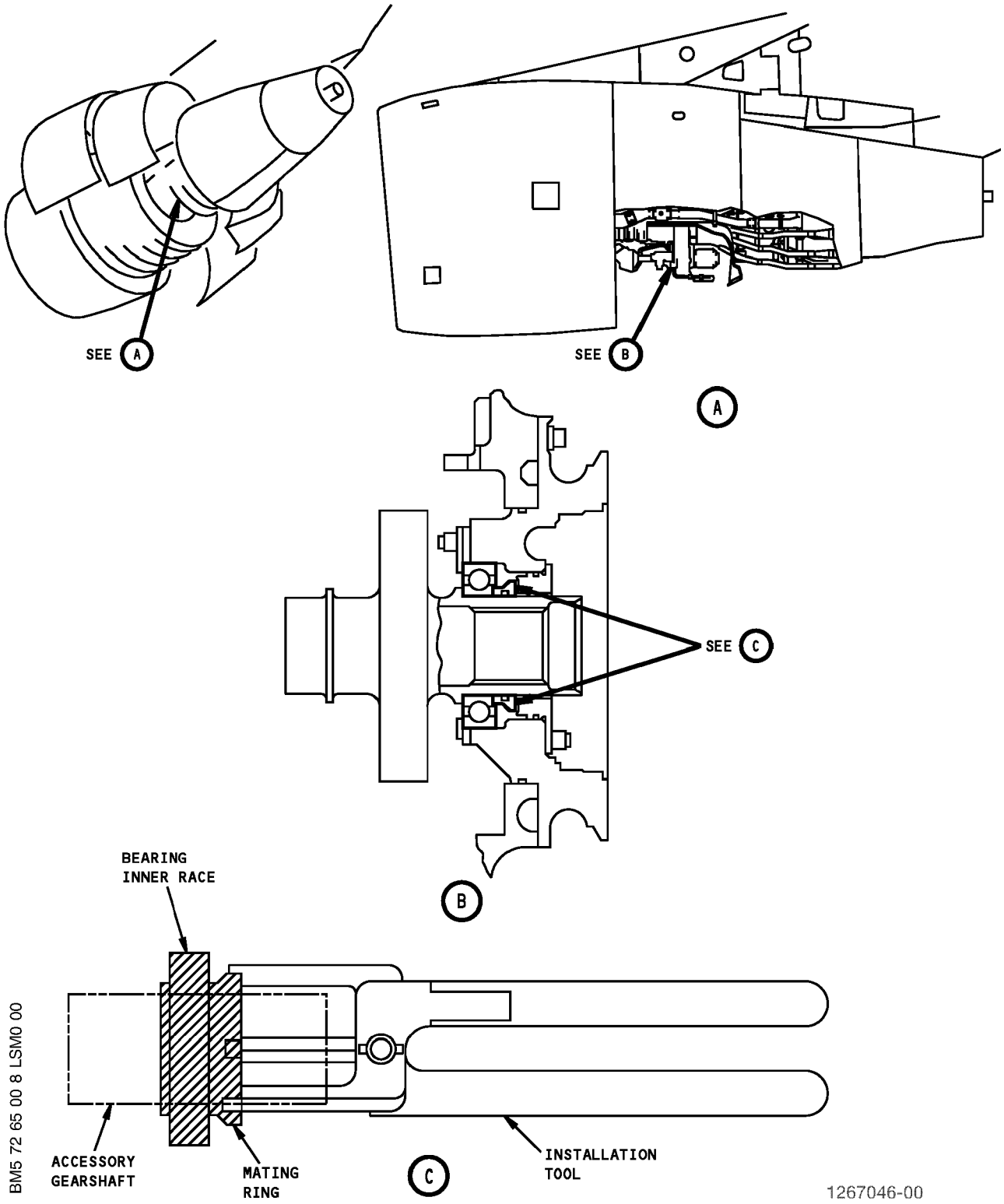
B



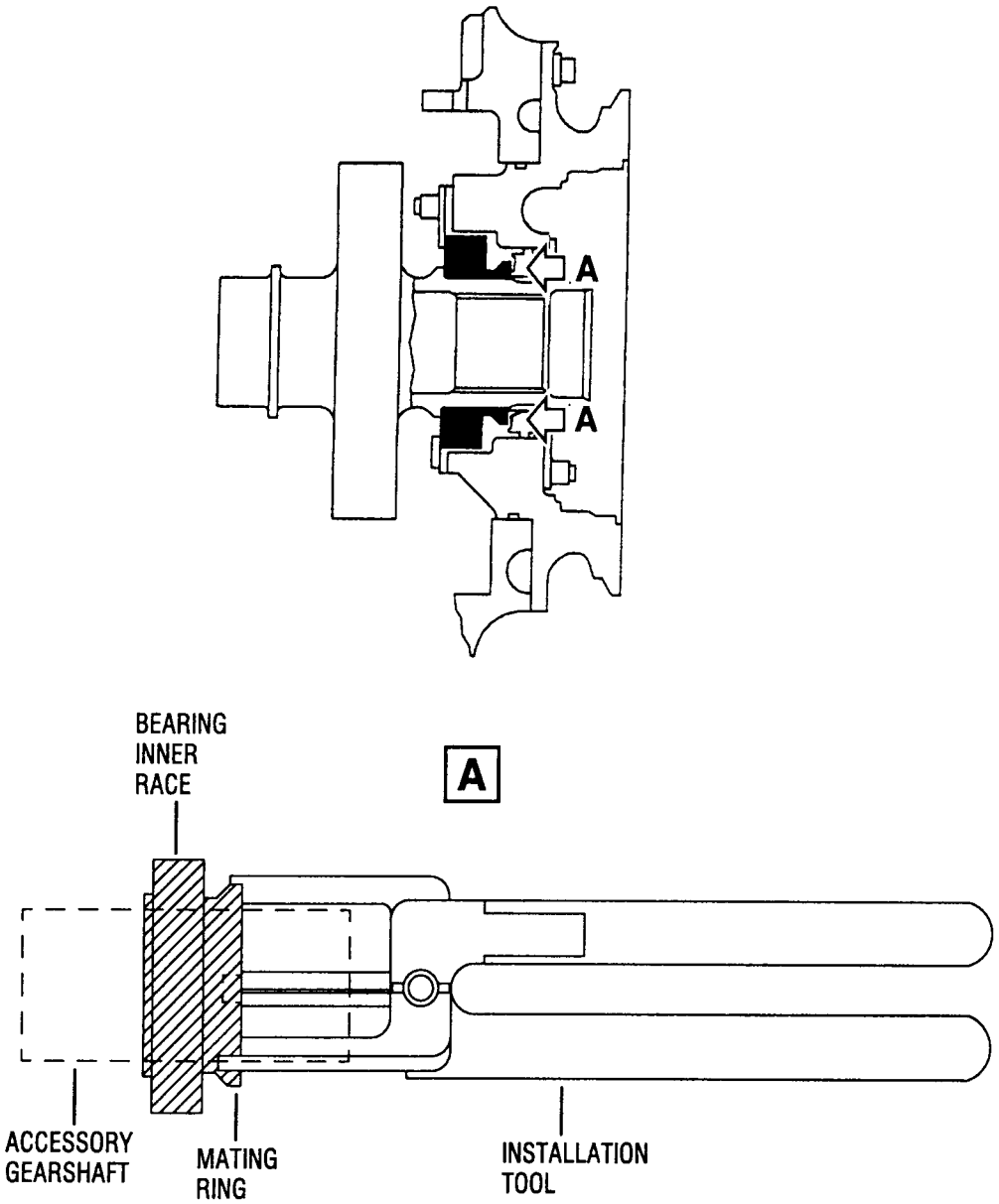
1109723-00-A

BM5 72 65 00 8 LPMJ - 00

Carbon Seal and Ring Assembly Installation (Sheet 2/2)
Figure 805



Mating Ring Tool Installation
Figure 806



BM5 72 65 00 8 LQMO - 00

Mating Ring Tool Installation
Figure 807

A. Equipment and Materials

ITEM	DESIGNATION
(1)	Circuit Breaker Safety Clips
(2)	1/4 - 28 UNF Jackscrews (3)
(3)	Heat Gun
(4)2C14673	Tool Set, Accessory, Inlet and Transfer Gearbox
- 9480M17G01 (Part of 2C14673)	Puller
- 9480M17G02 (Part of 2C14673)	Puller
- 9480M17G03 (Part of 2C14673)	Puller
- 9480M17G04 (Part of 2C14673)	Puller
(5)Material No.C02-019	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
(6)Material No.C02-033	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
(7)Material No.C10-009	Miscellaneous (Ref. 70-00-00)
Referenced Procedures	
- 24-11-11, P. Block 401	Integrated Drive Generator (IDG)
- 29-11-32, P. Block 401	Hydraulic Pump
- 73-12-01, P. Block 401	Fuel Pump
- 73-21-01, P. Block 401	Main Engine Control
- 77-12-01, P. Block 401	N2 Speed Sensor
- 79-21-01, P. Block 401	Lube and Scavenge Pump
- 80-13-01, P. Block 401	Pneumatic Starter

B. Job Set-Up

(1)Open, safety and tag the appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

(2)Remove accessories, as required, in order to remove the adapter-gearshaft package. The combination of adapters, accessories, and accessory removal procedures are as follows : (Ref. Fig. 808)

(a)At adapters No. 1 and 3, remove hydraulic pump (Ref. 29-11-32, P. Block 401).

(b)At adapter No. 4, remove Integrated Drive Generator (IDG) (Ref. 24-11-11, P. Block 401).

(c)At adapter No. 5, remove lube and scavenge pump (Ref. 79-21-01, P. Block 401).

(d)At adapter No. 6, remove starter (Ref. 80-13-01, P. Block 401).

(e)At adapter No. 7, remove fuel control (Ref. 73-21-01, P. Block 401).

(f)At adapter No. 8, remove fuel control (Ref. 73-12-01, P. Block 401).

(g)At adapter No. 7, remove N2 speed sensor (Ref. 77-12-01, P. Block 401).

C. Procedure

(1)If either pad No. 1,3,4,6 or 8 adapter-gearshaft package is replaced, remove the magnetic seal per approved repairs.

(2)Remove the adapter-gearshaft package as follows :

(a)Remove drain cap in scavenge line and drain gearbox. Reinstall cap, TORQUE to between 450 and 550 lbf. in. (5.08 and 6.21 m.daN) and wirelock.

(b)Remove brackets and tube clamps as required (Ref. Fig. 808)

(c)If the pad 7 adapter-gearshaft package is to be replaced, remove cover from pad by removing nuts, washers, and preformed packings (Ref. Fig. 809)

(d)Remove washers, bolts, and nuts or shoulder studs that mount adapter-gearshaft package on the accessory gearbox.

CAUTION : THE ADAPTER-GEARSHAFT, TO ENSURE AXIAL MOVEMENT, MUST BE SUPPORTED DURING REMOVAL TO AVOID DAMAGING GEARS AND BEARINGS.

(e)Use three 1/4-28 UNF jackscrews to remove the adapter-gearshaft package from the accessory gearbox.

(f)Immediately place the adapter-gearshaft package in a plastic bag to protect it from moisture and contamination.

(g)Remove roller bearing outer race from the gearbox housing as follows : (Ref. Fig. 810)

1 Remove nuts securing bearing to gearbox.

2 Heat area around the gearbox housing bore with a heat gun prior to removing bearing.

3 Remove roller bearing outer race using the following pullers (Ref. Fig. 811)

NOTE : Turn outer handle of puller counterclockwise to retract puller feet. Position puller feet in bearing bore and turn outer handle clockwise to engage feet with underside of bearing. Puller is properly engaged when top of puller feet support is within the notch on the side of the shaft threads. Remove bearing by turning inner handle clockwise.

- At pads 1, 3, 5 and 8, use puller 9480M17G02.
- At pads 2, 4 and 7 (fuel control), use puller 9480M17G03.
- At pad 6 use puller 9480M17G01.
- At pad 7 (N2 speed sensor) use puller 9480M17G04.

(h)Immediately place outer race into the plastic bag with the adapter-gearshaft package.

NOTE : The outer race and inner race of the roller bearing must be kept together as a matched set.

R (j)If the replacement adapter is not to be installed immediately, cover the adapter pad of the gearbox with Material No.C10-009 to prevent entry of moisture or contamination.

(3)Install the adapter-gearshaft package as follows :

CAUTION : THE OUTER RACE AND INNER RACE FOR EACH ROLLER BEARING ARE A MATCHED SET, WITH MATCHED SERIAL NUMBERS. INSTALLATION OF MISMATCHED FACES CAN RESULT IN BEARING FAILURE.

(a)Install bearing outer race as follows : (Ref. Fig. 810)

1 Apply a light coat of Material No.C02-019 to outer surface of bearing and inner surface of gearbox bore.

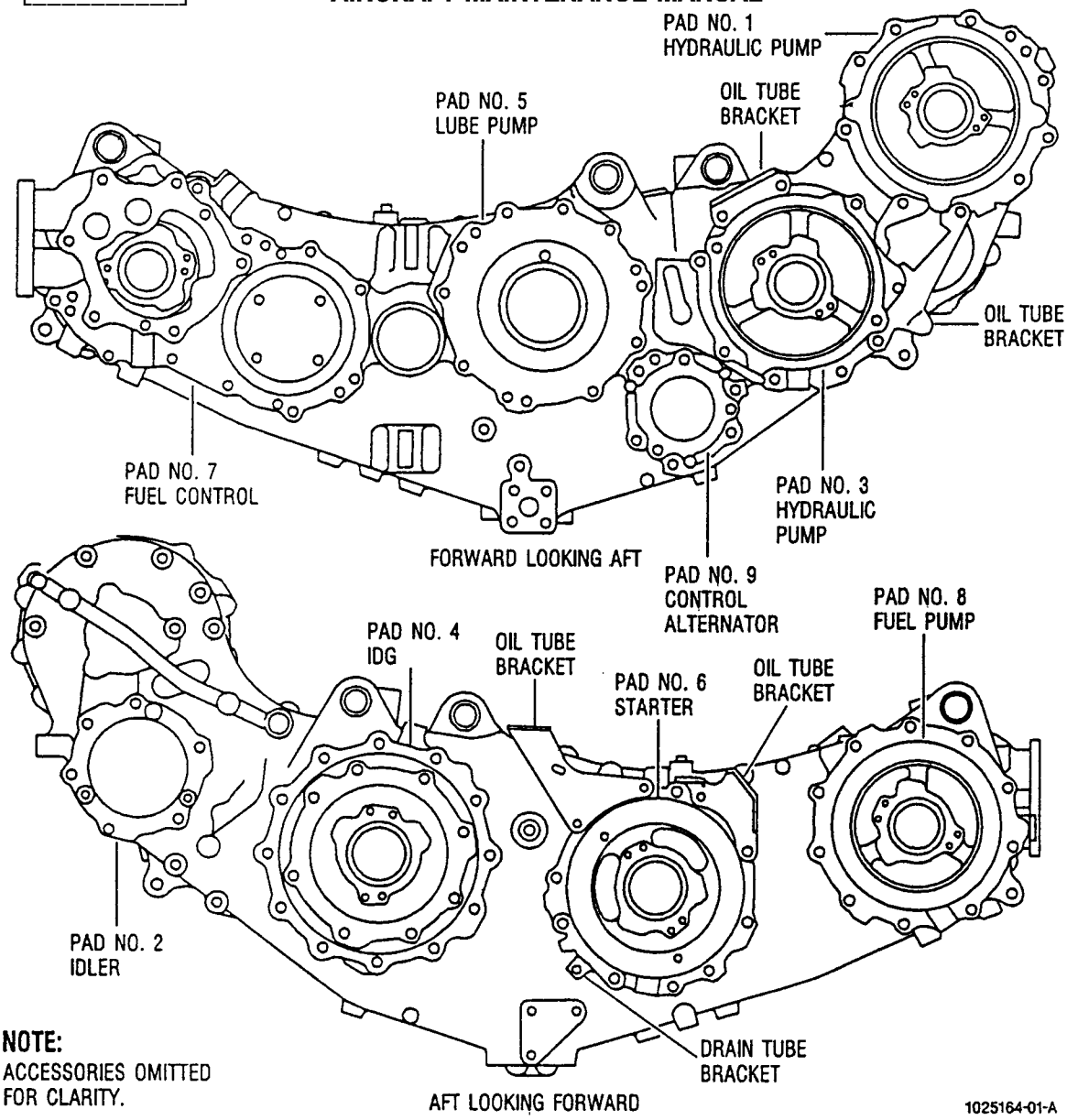
2 Heat area around the gearbox housing bore with a heat gun.

3 Align flange holes of the bearing with studs in gearbox and carefully push bearing into gearbox bore. Use a fiber drift and a nylon mallet to seat bearing.

4 Install nuts and TORQUE to between 55 and 70 lbf. in. (0.62 and 0.79 m.daN).

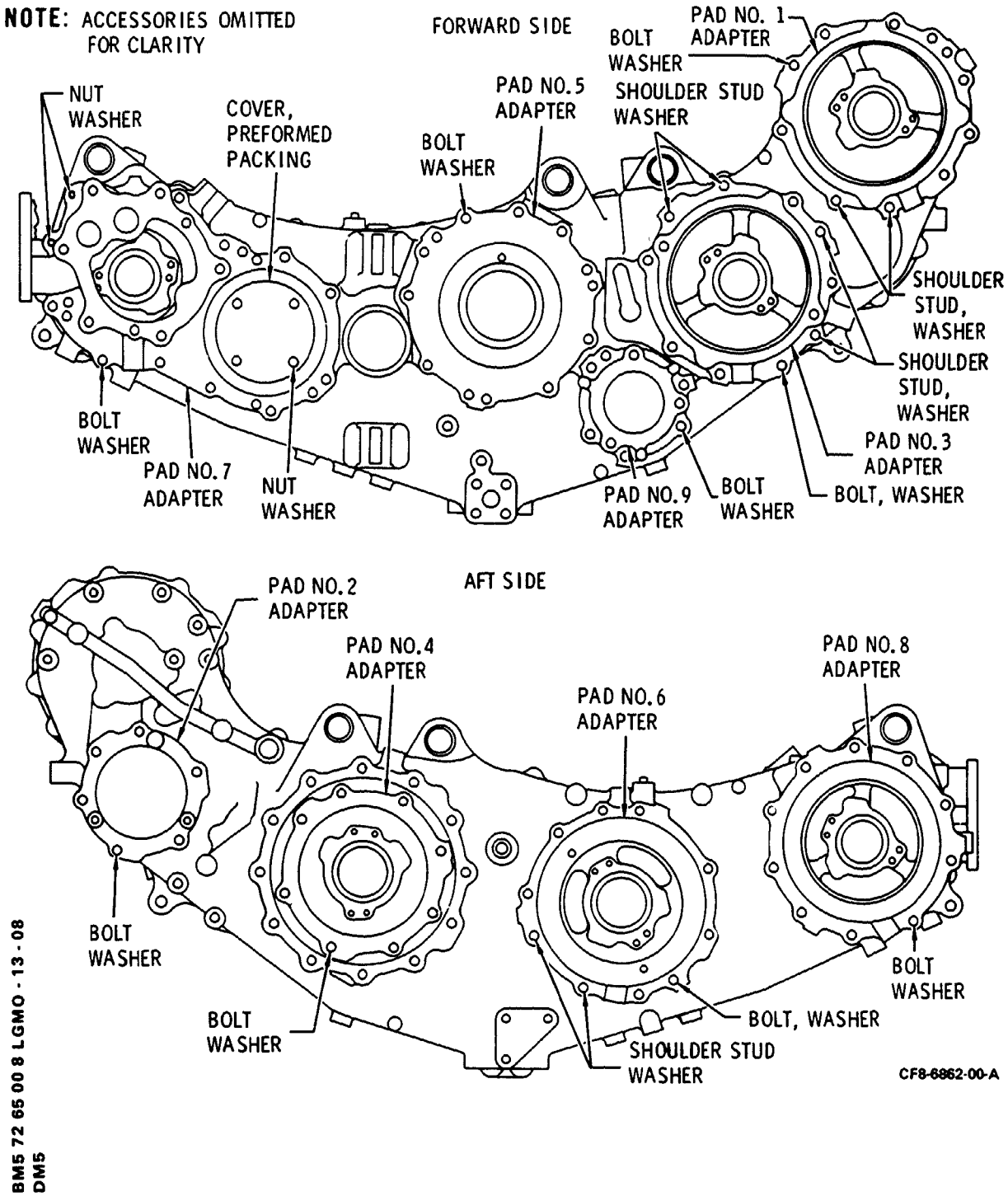
(b)Install adapter-gearshaft package as follows :

1 Install new preformed packing lubricated with Material No.C02-019 in groove in adapter rabbet.



BM5 72 65 00 8 LEMO - 01

Accessory Gearbox Adapter and Bracket Locations
Figure 808



Accessory Gearbox Adapter Mounting Hardware
Figure 809

2 Coat roller bearing rollers lightly with Material No.C02-033 and push rollers into race to minimize OD of roller circle.

CAUTION : DO NOT FORCE ADAPTER-GEARSHAFT PACKAGE, AND DO NOT USE BOLTS TO DRAW ADAPTER-GEARSHAFT PACKAGE INTO GEARBOX HOUSING. EXERCISE EXTREME CARE TO ENSURE THAT THE ROLLER BEARING ENGAGES THE OUTER RACE PROPERLY AND THAT THE GEARS MESH PROPERLY.

3 Align bolt holes in adapter with bolt holes in gearbox pad and carefully insert adapter-gearshaft package into the gearbox. If necessary, heat gearbox bore to ease rabbet engagement.

4 Install washers and bolts, nuts or shoulder studs (Ref. Fig. 809)

5 Tighten bolts, nuts, and shouldered studs in a criss-cross pattern. TORQUE to between 55 and 70 lbf. in. (0.62 and 0.79 m.daN).

(c) If pad 7 adapter-gearshaft package was replaced, install cover with new preformed packing lubricated with Material No.C02-019, and secure with washers and nuts. TORQUE to between 55 and 70 lbf. in. (0.62 and 0.79 m.daN).

(d) Install brackets and tube clamps, as necessary, as shown. (Ref. Fig. 808)

(4) If either pad No. 1, 3, 4, 6 or 8 adapter-gearshaft package is replaced, install magnetic seal assembly per approved repairs.

D. Close-Up

(1) Install accessory, as required, on gearbox drive pad in accordance with the following procedures :

(a) Install hydraulic pump (Ref. 29-11-32, P. Block 401) and IDG (Ref. 24-11-11, P. Block 401).

(b) Install lube and scavenge pump (Ref. 79-21-01, P. Block 401).

R (c) Install starter (Ref. 80-13-01, P. Block 401).

R (d) Install main engine control (Ref. 73-21-01, P. Block 401).

R (e) Install fuel pump (Ref. 73-12-01, P. Block 401).

R (f) Install N2 speed sensor (Ref. 77-12-01, P. Block 401).

(2) Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

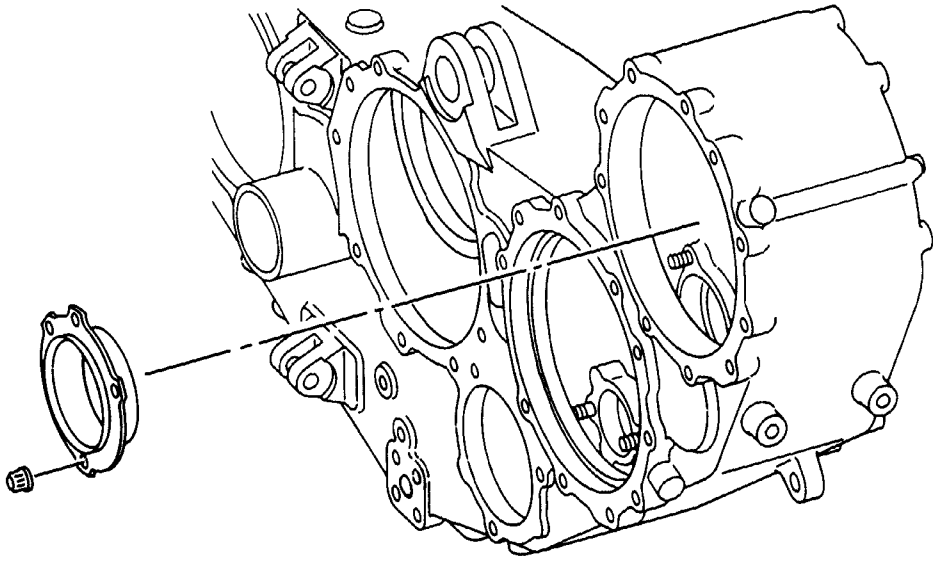
(3) Remove safety clips and tags and close the appropriate circuit breakers. Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).

R 3. Replacement of Accessory Gearbox Control Alternator Adapter - Gearshaft Package

R WARNING : YOU MUST WAIT AT LEAST 30 MINUTES AFTER THE ENGINE HAS BEEN SHUT DOWN BEFORE YOU REMOVE AN OIL SYSTEM COMPONENT. HOT OIL FROM THE OIL SYSTEM CAN CAUSE SEVERE BURNS. CONTACT OF THE LUBRICATING OIL WITH YOUR SKIN FOR A LONG TIME CAN CAUSE INJURY.

R WARNING : LUBE OIL WILL DRAIN INTO THE BOTTOM OF GEARBOX AFTER SHUTDOWN. SEVERAL LITERS OF OIL CAN DRAIN FROM THE GEARBOX WHEN YOU REMOVE THE STATOR. A CONTAINER MUST BE AVAILABLE TO CATCH OIL. OIL MAY BE HOT. WEAR PROTECTIVE EYEWEAR AND GLOVES.

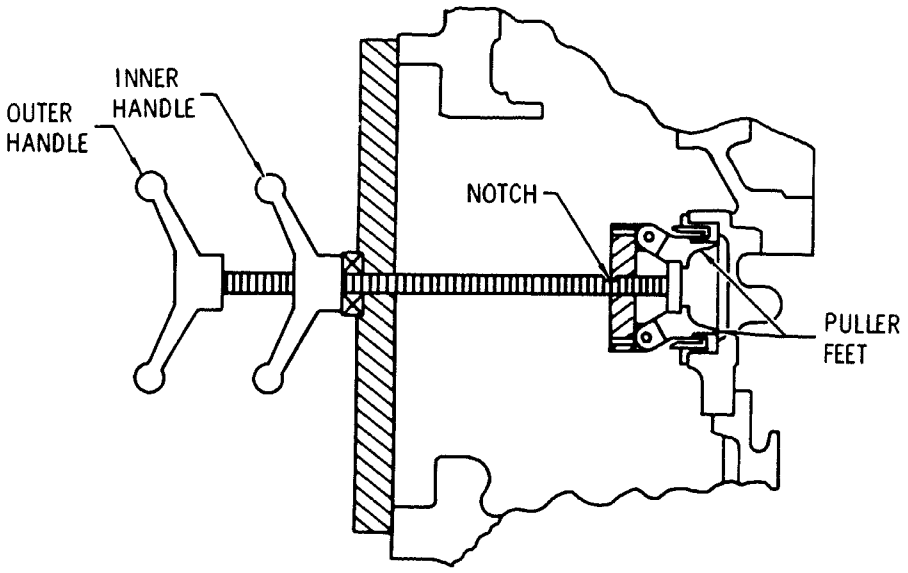
R CAUTION : DO NOT REPLACE THE ROTOR OR STATOR IN CONDITIONS THAT COULD CAUSE CONTAMINATION. THIS INCLUDES DUSTY OR WINDY CONDITIONS, RAIN OR IF YOU DO EXTERNAL CLEANING OR MAINTENANCE ON OR AROUND



CF8-6863-00-C

BM5 72 65 00 8 LJMO - 13 - 08
DM5

Removal/Installation of Bearing Outer Race (Typical)
Figure 810



CF8-6287-00-C

BM5 72 65 00 8 LLMO - 13 - 08
DM5

Roller Outer Race Removal Tool 9480M17
Figure 811

R THE ENGINE THAT CAN LEAD TO CONTAMINATION. OPERATOR CLOTHES AND
R TOOLS SHOULD BE CLEAN AND FREE OF PARTICLES THAT CAN DROP INTO
R THE ACCESSORY GEARBOX OR BEARINGS. IF IT IS NECESSARY TO WORK ON
R OR REPAIR ANY SURFACES OF THE GEARBOX AGAIN, PUT A PROTECTIVE
R COVER ON ALL OPEN AREAS TO KEEP CONTAMINATION OUT. WIPE GEARBOX
R SURFACES CLEAN WITH ISOPROPYL ALCOHOL AND LINT FREE WIPES BEFORE
R YOU REMOVE THE ALTERNATOR TO KEEP CONTAMINATION FROM FALLING
R INTO THE GEARBOX OR ALTERNATOR DRIVE WHEN YOU DO THE
R INSTALLATION. PUT A COVER ON OPEN AREAS IN THE GEARBOX OR
R ALTERNATOR DRIVE, IF YOU DO NOT IMMEDIATELY REPLACE THE HARDWARE.
R PARTICLES OR CONTAMINATION THAT FALL INTO THE GEARBOX OR BEARINGS
R CAN LEAD TO FAILURES.

R A. Equipment and Materials

ITEM	DESIGNATION
(1)	Circuit Breaker Safety Clips
(2)	1/4 - 28 UNF Jackscrews (3)
(3)	Container - Oil Resistant, 5 US Gal (19 l)
(4)	Gloves - Heat Protective
(5)	Protective eyewear
(6)	Protective caps
(7)	Protective covers
(8)Material No.C02-019	Anti-Seize Compounds, Lubricants, Oils (Ref. 70-00-00)
(9)Material No.C10-071	Miscellaneous (Ref. 70-00-00)
Referenced Procedures	
- 24-11-11, P. Block 401	Integrated Drive Generator (IDG)
- 29-11-32, P. Block 401	Hydraulic Pump
- 71-13-00, P. Block 301	Cowl Doors
- 72-65-00, P. Block 801	Accessory Gearbox Assembly
- 73-12-01, P. Block 401	Fuel Pump
- 73-21-01, P. Block 401	Main Engine Control
- 77-12-01, P. Block 401	N2 Speed Sensor
- 79-21-01, P. Block 401	Lube and Scavenge Pump
- 80-13-01, P. Block 401	Pneumatic Stater

R B. Job Set-Up
R (1)Open, safety and tag the appropriate circuit breakers and open fan and
R thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
R (2)Remove accessories, as necessary, in order to remove the control
R alternator adapter-gearshaft package. The combination of adapters,
R accessories, and accessory removal procedures are as follows :
R (Ref. Fig. 812, 813, 814).
R (a)At adapters No. 1 and 3, remove hydraulic pump (Ref. 29-11-32,
R P. Block 401).
R (b)At adapter No. 4, remove Integrated Drive Generator (IDG)
R (Ref. 24-11-11, P. Block 401).
R (c)At adapter No. 5, remove lube and scavenge pump (Ref. 79-21-01,
R P. Block 401).
R (d)At adapter No. 6, remove starter (Ref. 80-13-01, P. Block 401).

R (e)At adapter No. 7, remove main engine control (Ref. 73-21-01, P. Block 401).
R (f)At adapter No. 8, remove fuel pump (Ref. 73-12-01, P. Block 401).
R NOTE : If the fuel pump (pad No. 8) is removed, you must remove the magnetic seals from pads No. 7 and 8.
R (g)At adapter No. 7, remove N2 speed sensor (Ref. 77-12-01, P. Block 401).
R (3)If it is necessary, remove the magnetic seal (Ref. 72-65-00, P. Block 801).

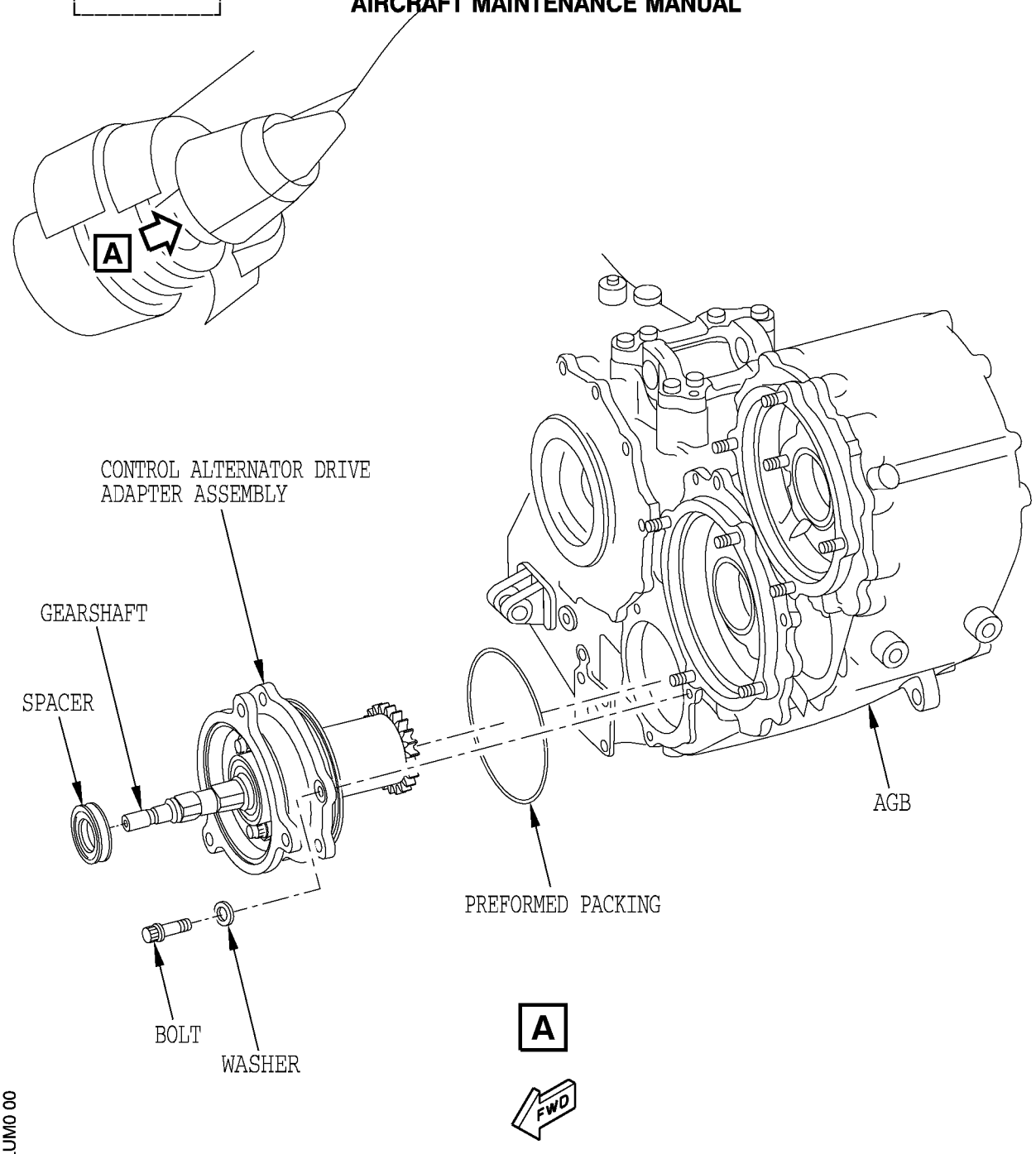
R C. Procedure
R (1)Remove the accessory gearbox control alternator adapter - gearshaft package as follows :
R (a)Do these steps to drain the engine oil from the Accessory Gearbox (AGB) scavenge tube :
R (Ref. Fig. 815, 816, 817).
R 1 Put a container under the AGB scavenge tube.
R 2 Remove the cap assembly from the AGB scavenge tube and let the oil drain into a 5 US Gal (19 l) oil resistant container.
R - Discard the preformed packing.
R (b)Install the drain cap :
R 1 Put a thin layer of lubricant on the new preformed packing with Material No.C02-019.
R 2 Install the preformed packing on the drain plug.
R 3 Install the cap assembly onto the AGB Scavenge tube.
R -TORQUE to between 450 and 550 lbf.in. (5.09 and 6.22 m.daN).
R (c)Remove the brackets and tube clamps as necessary for the control alternator adapter (Pad 9) :
R 1 Remove the AGB scavenge inlet tube : (Ref. Fig. 815, 816, 817).
R 2 Remove the nut (13) and the bolt (14) that attach the loop clamp (15) to the loop clamp (16) to the AGB oil scavenge tube (1) and lube and scavenge pump oil tube (12).
R 3 Remove the bolt (17) and loop clamp (18) that attach the lube and scavenge pump oil tube (12) to the oil scavenge tube bracket (8).
R 4 Remove the two bolts (7) and remove the oil scavenge tube bracket (8).
R 5 Put a container under the engine below the lube and scavenge pump and AGB.
R Pre GE SB 73-0313
R 6 Disconnect the fuel oil servo tube (9) from AGB oil scavenge tube (1).
R 7 Install protective cap on the fuel oil servo tube opening.
R End Pre SB 73-0313
R 8 Remove the two bolts (2) that attach the AGB oil scavenge tube (1) and the flange seal gasket (6) to the pad on the AGB.
R 9 Remove and discard the flange seal gasket (6).
R 10 Remove the three bolts (3) and washers (4) that attach the AGB oil scavenge tube (1) to the lube and scavenge pump. Do a visual inspection on the lube-in seal gasket (5) for damage and replace the seal gasket if necessary.
R 11 Remove the AGB oil scavenge tube (1).
R 12 Install protective covers over openings in gearbox and lube and scavenge pump.

R 13 Remove the scavenge discharge tube : (Ref. Fig. 815, 816, 817).
R - Remove the bolts (11) and the washers (10) that attach the lube and scavenge pump oil tube (12) to the lube and scavenge pump.
R - Loosen the B-nut on the aft end of the scavenge pump oil tube (12) that connects the scavenge pump oil tube (12) to the oil scavenge chip detector tube on the underside of the AGB.
R - Remove the lube and scavenge pump oil tube (12).
R - Do a visual inspection to the flange seal gasket assembly (19) for damage and replace it if necessary.
R - Install protective covers over openings in gearbox and lube scavenge pump.
R (d)If you removed the fuel control (pad 7), remove the nuts, washers, and packing to remove the cover from the motoring pad.
R WARNING : REMOVE THE ADAPTER PACKAGE VERY CAREFULLY, IT IS EASY TO DAMAGE THE GEARS AND THE BEARING WHEN YOU REMOVE THE ADAPTER. DAMAGE TO THE ENGINE CAN OCCUR.
R (e)Remove the bolts, washers, or shoulder studs that attach the adapter package to the AGB.
R (f)Use three jackscrews to remove the adapter package from the accessory gearbox.
R (g)Immediately put the adapter package in a plastic bag.
R CAUTION : DO NOT REPLACE THE ROTOR OR STATOR IN CONDITIONS THAT COULD CAUSE CONTAMINATION. THIS INCLUDES DUSTY OR WINDY CONDITIONS, RAIN OR IF YOU DO EXTERNAL CLEANING OR MAINTENANCE ON OR AROUND THE ENGINE THAT CAN LEAD TO CONTAMINATION. OPERATOR CLOTHES AND TOOLS SHOULD BE CLEAN AND FREE OF PARTICLES THAT CAN DROP INTO THE ACCESSORY GEARBOX OR BEARINGS. IF IT IS NECESSARY TO WORK ON OR REPAIR ANY SURFACES OF THE GEARBOX AGAIN, PUT A PROTECTIVE COVER ON ALL OPEN AREAS TO KEEP CONTAMINATION OUT. WIPE GEARBOX SURFACES CLEAN WITH ISOPROPYL ALCOHOL AND LINT FREE WIPES BEFORE YOU REMOVE THE ALTERNATOR TO KEEP CONTAMINATION FROM FALLING INTO THE GEARBOX OR ALTERNATOR DRIVE WHEN YOU DO THE INSTALLATION. PUT A COVER ON OPEN AREAS IN THE GEARBOX OR ALTERNATOR DRIVE, IF YOU DO NOT IMMEDIATELY REPLACE THE HARDWARE. PARTICLES OR CONTAMINATION THAT FALL INTO THE GEARBOX OR BEARINGS CAN LEAD TO FAILURES.
R CAUTION : DO NOT USE FORCE TO INSTALL THE ADAPTER AND THE GEARSHAFT INTO THE GEARSHAFT HOUSING. DO NOT USE THE NUTS TO PUSH THE ADAPTER AND THE GEARSHAFT INTO THE GEARBOX HOUSING. BE VERY CAREFUL TO MAKE SURE THE GEARSHAFT ENGAGES WITH THE GEARSHAFT OF THE AGB.
R (2)Install the Accessory Gearbox Control Alternator Adapter - Gearshaft Package as follows :
(Ref. Fig. 812, 813, 814).
R (a)Install the preformed packing (3), lubricated with Material No.C02-019 onto the adapter.
R (b)Install the adapter and the gearshaft into the gearbox housing aligning the adapter holes with the bolt holes on the AGB housing. Turn the gearshaft slightly to make installation easy.
R NOTE : You will only feel the gearshat turn a small amount.
R NOTE : Protect the exposed bearing and shaft with protective covers.

R (c)Check the gearshaft to make sure it turns easily.
R (d)Lubricate the threads of the adapter bolts (1) with Material No.C02-019 and install the bolts (1) and washers (2) to attach the adapter. TORQUE the adapter bolts to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN). Attach the bolts with Material No.C10-071.
R (e)If the fuel control (pad 7) adapter package was replaced :
R 1 Lubricate the new packing for the cover plate with Material No.C02-019.
R 2 Install the cover with the washers and nuts.
R 3 TORQUE to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN).
R (f)Install the brackets and the tube clamps, as it is necessary : (Ref. Fig. 815, 816, 817).
R (g)For installation of the Control Alternator Adapter (Pad 9), install the AGB Scavenge Tube as follows : (Ref. Fig. 815, 816, 817).
R 1 Install the three-bolt hole flanged end of the AGB oil scavenge tube (1) on the top-left forward port, forward looking aft (FLA), of the lube and scavenge pump.
R NOTE : The AGB oil scavenge tube goes to the right, and aft from the lube and scavenge pump. The four bolt hole flanges end of the AGB oil scavenge tube is attached to a port on the lower forward face of AGB.
R 2 Do a visual inspection to the lube-in seal gasket (5) to make sure it is serviceable.
R 3 Install a washer (4) on each bolt (3).
R 4 Install the three bolts (3) through the bottom of the lube and scavenge pump and into the AGB oil scavenge tube (1) flange. Put the bolts into the tube but do not tighten the bolts.
R 5 Install a new flange seal gasket (6) between the AGB oil scavenge tube (1) and the pad on the forward face of the AGB housing.
R 6 Align the bolt holes and install the AGB oil scavenge tube (1) to the AGB housing with two bolts (2). Install the bolts in the bolt holes on the right side of the AGB oil scavenge tube flange, aft looking forward (ALF).
R 7 Install the oil scavenge tube bracket (8) on the forward, left side of the flange of the AGB oil scavenge tube (1), FLA, with two bolts (7).
R NOTE : The oil scavenge tube bracket (8) points to the right and forward.
R 8 TORQUE the two bolts (2) and two bolts (7) to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN). Install safety wire or cable to the two bolts (2) and the two bolts (7). TORQUE the three bolts (3) to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN).
R 9 Install the loop clamp (18) on the lube and scavenge pump oil tube (12). Attach the oil tube and loop clamp to the oil scavenge tube bracket (8) with the bolt (17). TORQUE the bolt to between 55 and 70 lbf.in. (0.62 and 0.79 m.daN).
R 10 Install loop clamp (15) on the AGB oil scavenge tube (1) and loop clamp (16) on the lube and scavenge pump oil tube (12). Attach the loop clamps together with bolt (14) and nut (13). TORQUE the nut to between 33 and 37 lbf.in. (0.37 and 0.42 m.daN).
R NOTE : The loops of the loop clamps (15) and (16) point away from

R each other, and the open end of the loop clamps point forward.
R The bolt head on the bolt (14) faces to the right, FLA.
R Pre GE SB 73-0049
R 11 Connect the fitting nut of fuel oil servo tube (9) to the AGB oil
R scavenge tube, (1). TORQUE the fitting nut to between 270 and
R 300 lbf.in. (3.05 and 3.39 m.daN).
R End Pre GE SB 73-0049
R (h)If the pads No. 3, 4, 6, 7, or 8 adapter packages were removed, install
R the AGB magnetic seal assembly per approved repairs (Ref. 72-65-00,
R P. Block 801).
R NOTE : If pad No. 8 adapter package was replaced, install the
R magnetic seal assembly at pads No. 7 and 8.

R D. Close-Up
R (1)If accessories were removed in order to remove the control alternator
R adapter-gearshaft package, install the accessories, as required, on
R gearbox drive pad in as follows :
R (Ref. Fig. 812, 813, 814).
R (a)Install hydraulic pump (Ref. 29-11-32, P. Block 401) and IDG
R (Ref. 24-11-11, P. Block 401).
R (b)Install lube and scavenge pump (Ref. 79-21-01, P. Block 401).
R (c)Install starter (Ref. 80-13-01, P. Block 401).
R (d)Install main engine control (Ref. 73-21-01, P. Block 401).
R (e)Install fuel pump (Ref. 73-12-01, P. Block 401).
R (f)Install N2 speed sensor (Ref. 77-12-01, P. Block 401).
R (2)Make sure that the work area is clean and clear of tools and equipment.
R (3)Remove safety clips and tags and close the applicable circuit breakers
R and close thrust reverser and fan cowl doors (Ref. 71-13-00,
R P. Block 301).



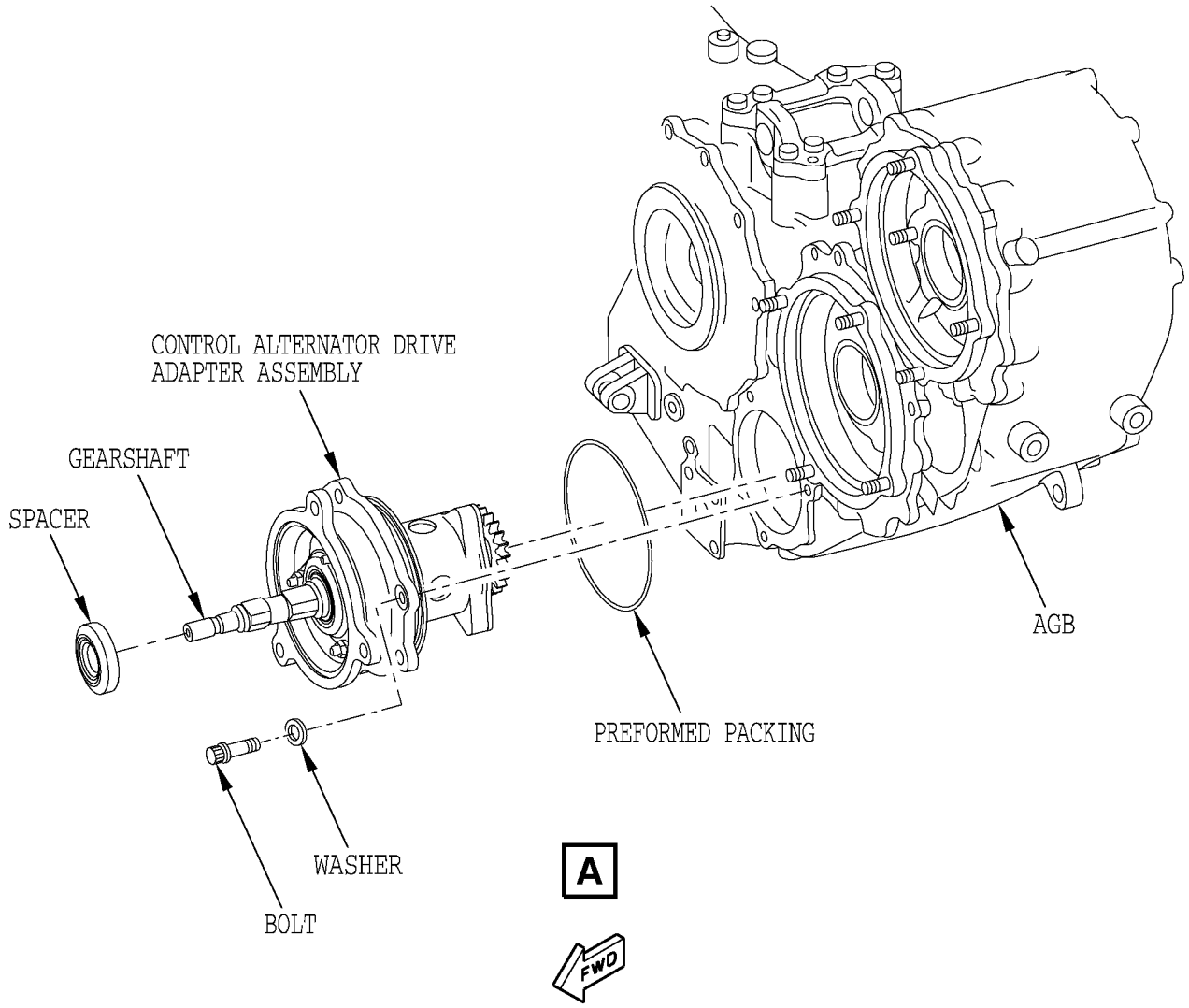
PRE S/B 72-0797

1286695-00

BM5 72 65 00 8 LUM0 00

Accessory Gearbox Control Alternator Adapter -
Gearshaft Package (Pre SB 72-0797)
Figure 812

R



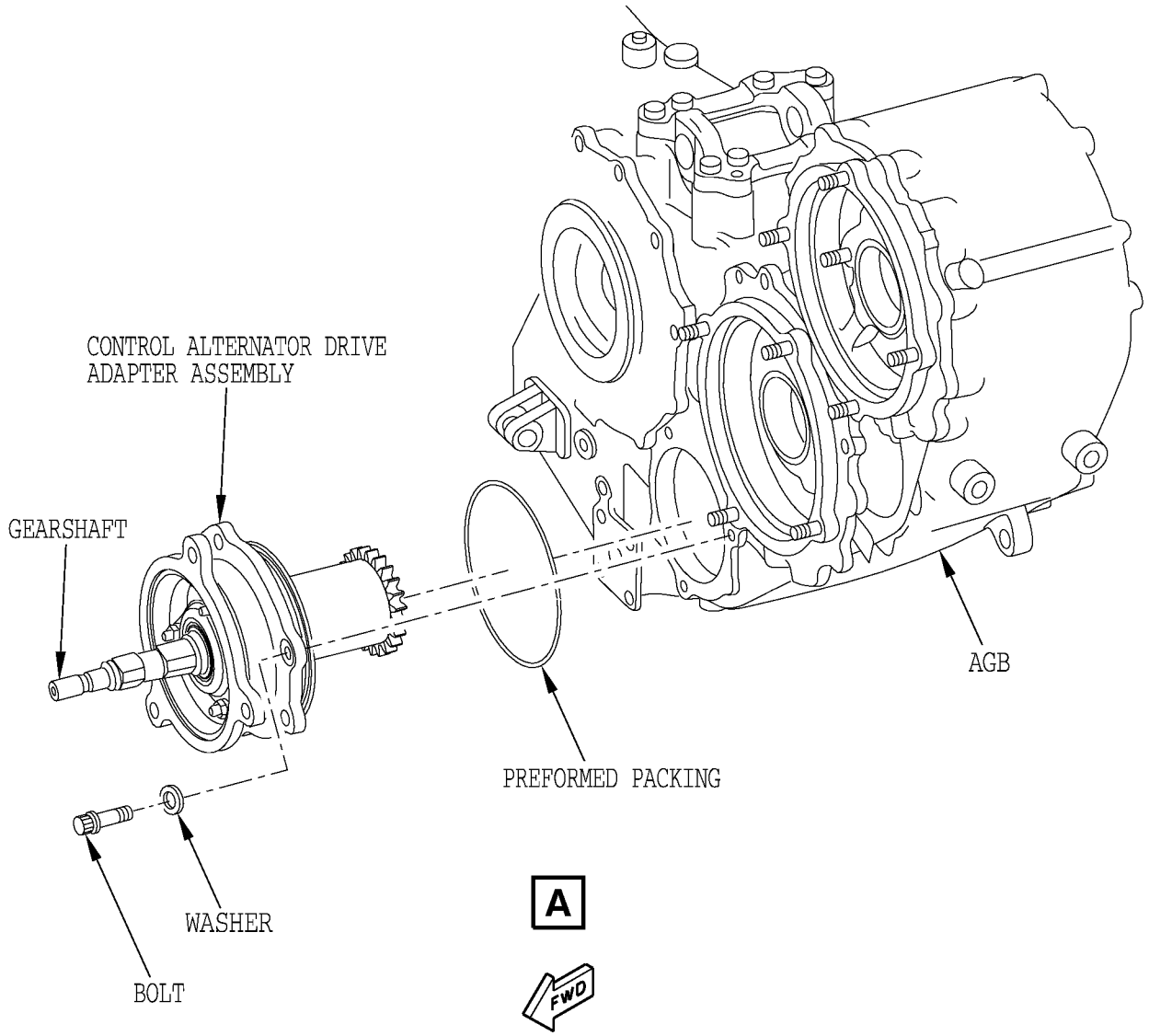
POST S/B 72-0797
PRE S/B 72-1260

1286696-00

BM5 72 65 00 8 LVM0 00

Accessory Gearbox Control Alternator Adapter -
Gearshaft Package (Post SB 72-0797 and Pre SB 72-1260)
Figure 813

R



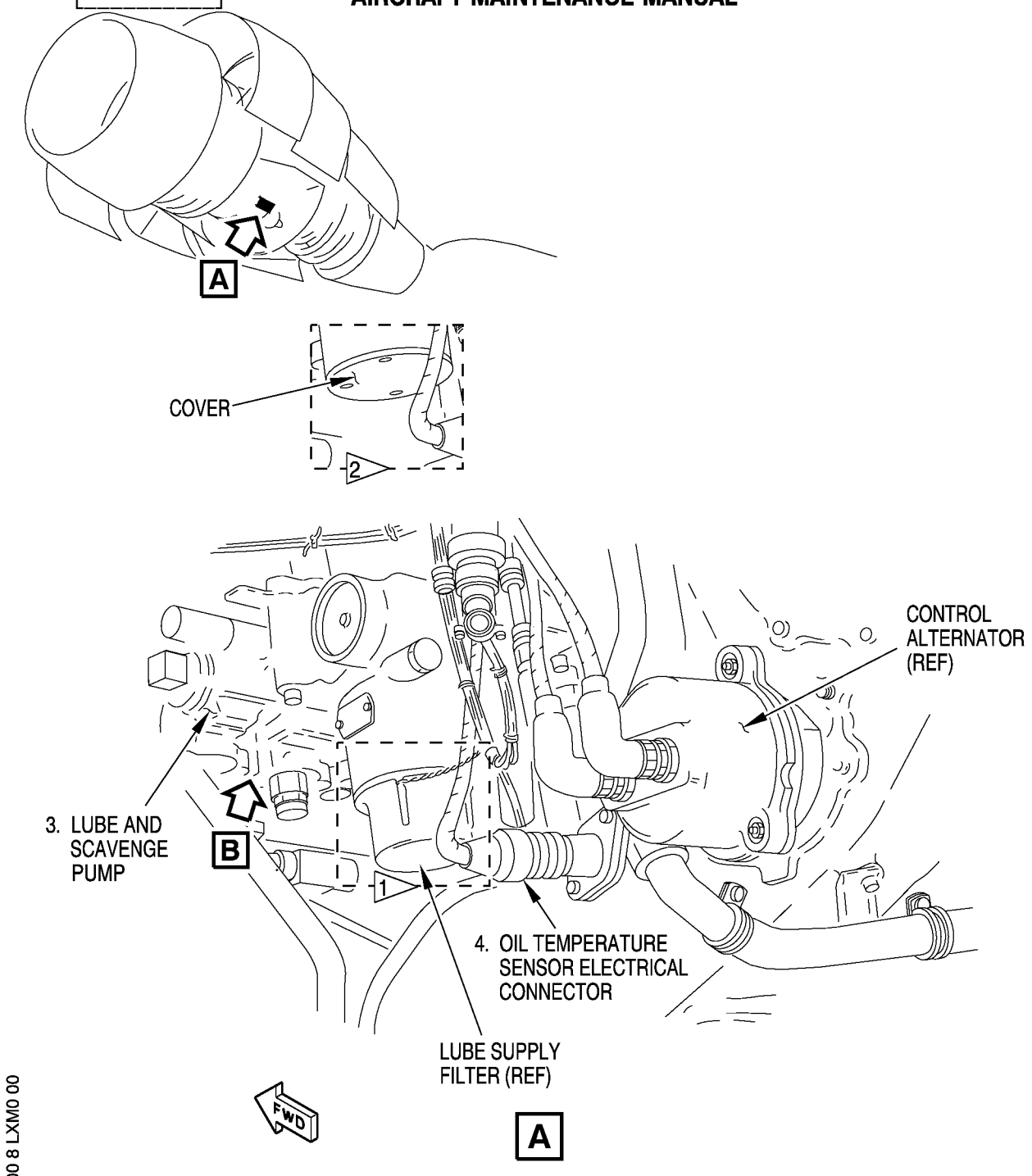
POST S/B 72-1260

1286697-00

BM5 72 65 00 8 LWM0 00

Accessory Gearbox Control Alternator Adapter -
Gearshaft Package (Pre SB 72-1260)
Figure 814

R



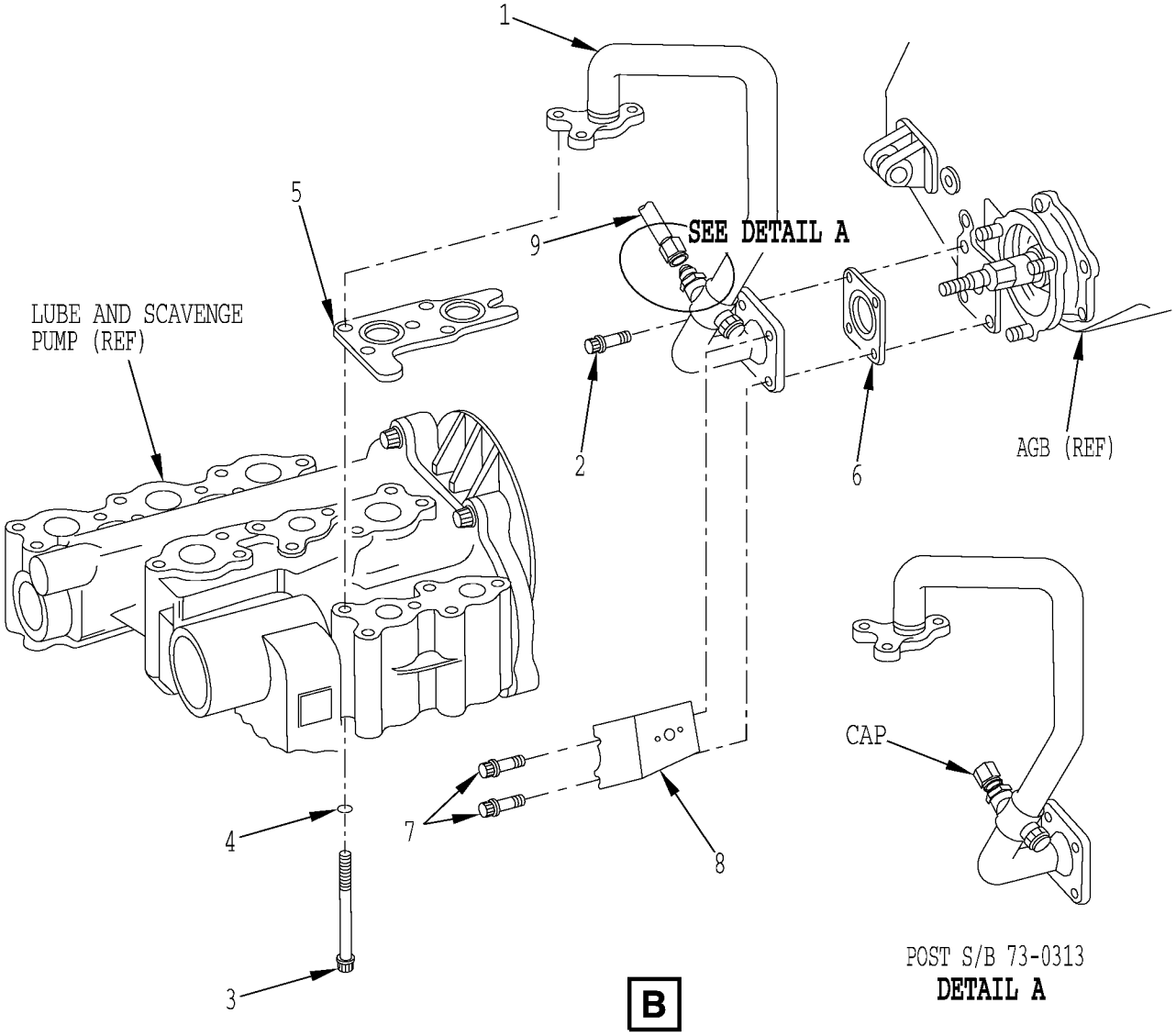
1 ENGINES PRE-GE-SB 79-047
2 ENGINES POST-GE-SB 79-047

BM5 72 65 00 8 LXM0 00

1286338-00

R

AGB Scavenge Line Drain Location
Figure 815



LEGEND:

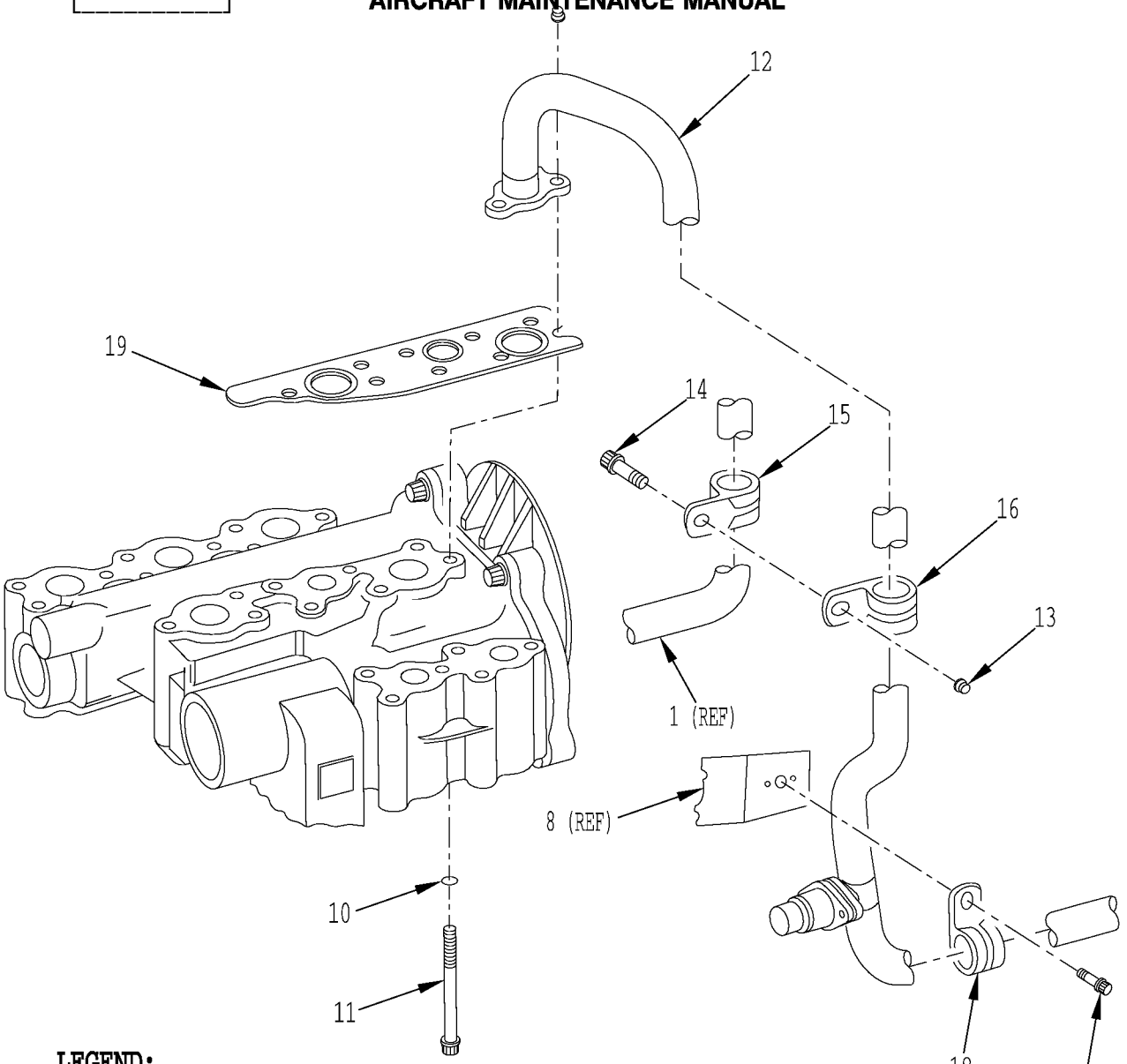
1. AGB OIL SCAVENGE TUBE
2. BOLT (QTY-2)
3. BOLT (QTY-2)
4. WASHER (QTY-3)
5. LUBE-IN SEAL GASKET
6. FLANGE SEAL GASKET
7. BOLT (QTY-2)
8. OIL SCAVENGE TUBE BRACKET
9. FUEL OIL SERVO TUBE
   (PRE S/B 73-0313 ONLY)

BM5 72 65 00 8 LYM0 00

1286339-00

R

AGB Scavenge Tubes
Figure 816



LEGEND:

10. WASHER (QTY-3)
11. BOLT (QTY-3)
12. LUBE AND SCAVENGE PUMP TO SERVO FUEL HEATER TUBE
13. NUT (QTY-1)
14. BOLT (QTY-1)
15. LOOP CLAMP
16. LOOP CLAMP
17. BOLT (QTY-1)
18. LOOP CLAMP
19. FLANGE SEAL GASKET

BM5 72 65 00 8 LZM0 00

1286340-00

R

AGB Scavenge Tubes
Figure 817